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BRITISH SEA - WEEDS.



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BRITISH SEA-WEEDS.

DRAWN FROM

PROFESSOR HARVEY'S "PHYCOLOGIA BRITANNICA."

WITH DESCRIPTIONS,

AN AMATEUR'S SYNOPSIS, RULES FOR LAYING OUT SEA-WEEDS,

AN ORDER FOR ARRANGING THEM IN THE HERBARIUM,

AND AN APPENDIX OF NEW SPECIES.

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INTRODUCTION.

“Come unto these yellow sands,
And there take hands ——”

EVEN the happy people of whom the strange phrase is used, that “money is no object to them,” cannot command fate altogether. They are mortal in respect of their minds; and cannot, with all appliances, get away from the inexorable law which rules that whoever would find the world interesting must work out an interest in it for himself. Much may be done, it is true, by unlimited wealth, to stave off the hour of *ennui*, but nothing answers so effectually as a healthy, earnest employment, whether of body or mind. Everything but what a man labours for becomes wearisome to him after a time—a cherished occupation never; for although on some particular day he may have tired himself in its pursuit, the object pursued is as dear to him as ever, when the next morning’s sun wakes him from the blessing of rest to the still higher blessing of exertion.

It may seem strange to open an introduction to a set of sea-weed descriptions with a somewhat trite moral reflection, but it has its particular mission in this particular case. It justifies the labour to which the book calls its readers, as well as that which the writer has gone through; and holds out to the former the encouragement of hope that their trouble will not be thrown away.

It was once prettily said by a lady who cultivated flowers, that she had “buried many a care in her garden;” and the sea-weed collector can often say the same of his garden—the shore; as many a loving disciple could testify, who, having taken up the pursuit originally as a resource against weariness, or a light possible occupation during hours of sickness, has ended by an enthusiastic love, which throws a charm over every sea-place on the coast, however dull and ugly to the world in general; makes every day spent there too short, and every visit too quickly ended. Only let there be sea, and plenty of low, dark rocks stretching out, peninsular-like, into it; and only let the dinner-hour be fixed for high-water time,—and the loving disciple asks no more of fate. Turn him out on that flat, and, to you (O Gentile of the outer courts), *uninteresting* shore, with a basket, a bottle, a stick, a strong pair of boots (oiled, not polished with blacking), and, let us add, to crown the comfort, a strong, friendly, and willing, if not learned companion; and all the crowned heads of Europe may be shaken without his being able to feel that he cares. When the returning tide has driven him backwards from his best hunting grounds, and sent him home at last to dinner and things of the earth, earthy, the squabbles of nations may come in for a share of his attention perhaps; but, even then, only imperfectly, for the collected treasures have to be examined and preserved, and the heart of the collector yearns after them.

Does any one doubt the truth of this picture, and imagine it merely a fancy description got up to throw a fictitious charm over the subject of the book? If he does so, let him undeceive himself at once. Fictitious extasies inevitably betray themselves, and he is no Lavater of the mind who can suspect that this is one. On the contrary, it is but a very poor transcript of the delight which hundreds have experienced already in this as in other investigations of the wonderful works of God; and it is to be hoped that hundreds will experience it again. Youth is not necessary to it, riches are not necessary to it, and a moderate amount of bodily health and strength will suffice, and will, in many cases, increase with the using; or the able and willing assistant-hunter may save the elder one a part of the bodily labour, and receive a more than double amount of good in return, as the two sit together on a rock for rest and pleasant discourse on things of Heaven and things of that Earth which the Almighty has given to the children of men, not merely as a picture-book to be stared at, but as written pages to be read and studied.

About this shore-hunting, however, as regards my own sex (so many of whom, I know, are interested in the pursuit), many difficulties are apt to arise; among the foremost of which must be mentioned the risk of cold and destruction of clothes. The best pair of single-soled kid Balmoral boots that ever were made will not stand salt water many days—indeed would scarcely “come on” after being thoroughly wetted two or three times in succession—and the sea-weed collector who has to pick her way to save her boots will never be a loving disciple as long as she lives! Any one, therefore, really intending to *work* in the matter, must lay aside for a time all thought of conventional appearances, and be content to support the weight of a pair of boy’s shooting boots, which, furthermore, should be rendered as far water-proof as possible by receiving a thin coat of neat’s-foot oil, such as is used by fishermen—a process well understood in most lodging-houses. It is true that sea-water does not usually give any one cold, but in sea-weed hunting, where there is so much standing and dawdling about, as well as walking, it is as well for beginners or delicate people not to be wet for any great length of time; and as for the hardier hunters who have learned to walk boldly into a pool if they suspect there is anything worth having in the middle of it, they will oil their boots, for the simple reason that it is a mere waste of time to black and polish them; for, polish as they will, a saline incrustation is sure to steal through at last. This advice cannot be enforced too strongly. It is both wasteful, uncomfortable, and dangerous to attempt sea-weed hunting in delicate boots. Wasteful, because a guinea pair will scarcely last a week. Uncomfortable, because to walk on some rocks in thin soles (the slate edges of those in Douglas Bay, for instance) is so painful, that it very soon becomes impossible. Dangerous, because you must be wetted through by the first bit of moist sand you come to, and it is not every one who would be justified in running the risk involved in this fact.

Next to boots comes the question of petticoats; and if anything could excuse a woman for imitating the costume of a man, it would be what she suffers as a sea-weed collector from those necessary draperies! But to make the best of a bad matter, let woollen be in the ascendant as much as possible; and let the petticoats never come below the ankle. A ladies’ yachting costume has come into fashion of late, which is, perhaps, as near perfection for shore-work as anything that could be devised. It is a suit consisting of a full short skirt of blue flannel or serge (like very fine bathing-gown material), with waistcoat and jacket to match. Cloaks and shawls, which necessarily hamper the arms, besides having long ends and corners which cannot

fail to get soaked, are, of course, very inconvenient, and should be as much avoided as possible; but where this cannot be, a good deal may be done towards tucking them neatly up out of the way. In conclusion, a hat is preferable to a bonnet, merino stockings to cotton ones, and a strong pair of gloves is indispensable. All millinery work—silks, satins, lace, bracelets, and other jewellery, &c. must, and will, be laid aside by every rational being who attempts to shore-hunt.

A stick was alluded to before, and is a very desirable appendage, both as a balance in rock-clambering and for drawing floating sea-weeds from the water. It should have a crook for a handle therefore. But about these sort of matters, people should amuse themselves by devising ingenious varieties. The basket may be lined with gutta percha, or exchanged, by those who care to invest in it, for an Indian-rubber bag, which can be strapped round the waist, and into an inside pocket of which a bottle or two for the more delicate sea-weeds may be easily stowed away. But the common basket which has served the bygone generation will do very well for any one who is in earnest in this. Few tools come amiss to a good workman, and it argues a rather *dilettante* state of mind to insist on having everything the perfection of convenience. Into which question comes also that of expenditure; and the reader is here assured, once for all, that it is quite possible to go shore-hunting for life quite comfortably without any extra expense whatever; that *very* strong-soled pair of boots perhaps alone excepted, and they will be found quite as useful in country walks afterwards, as on the sands.

Equipped, therefore, with as much woollen in the dress as possible, let us imagine a pair of friends starting for the shore. But they must never do so without ascertaining from more than one inquiry the real state of the tide. It sounds like a joke to say that a sea-weed collector should always order his dinner at high-tide hour, but the idea is a very good one, and, were there none but sea-weed collectors in a company, might be (under limits) carried out every day. Nevertheless, as there are plants well worth having, to be found near high-water mark, these can be looked for on the days when low-water occurs at dusk, or in the too early morning. All that is insisted upon here is, that no one should venture upon the shore among rocks, the ins-and-outs of which it needs long experience to understand, without ascertaining whether the tide is ebbing or flowing. A flowing tide often steals round the back of perhaps a pretty extensive field of low rocks instead of advancing straight over them, and in that case it is very easy to be surrounded before one is aware. A steady determination to wade and not be frightened is then the only resource; but the evil is better avoided, and this can be done by a little care and watchfulness. Both are necessary, however, and no enthusiasm must cause this fact to be forgotten. A casually-overheard remark, that a certain bay in the Scilly Isles was "deceitful," induced a late visitor there to be more than usually vigilant, although it was impossible by looking over it to detect where the danger lay. But when the tide had flowed for about a couple of hours it became evident that it was making a circuit, following an unobserved lower level among the rocks, and that a considerable portion of the hunting-ground would presently be left an island; high and dry itself for several hours probably, but not very easy to get away from, when climbing over boulders had to be combined with striding knee-deep in water. This was the Windmill Bay at St. Mary's, Scilly; and it is but one case among hundreds, for even flat sand-bank shores are not safe without attention, as any one who knows Withernsea, near Hull, will bear witness. Enough, however, of warnings, lest people should be frayed from venturing on the shore at all; whereas our hints are only intended to teach them to do it safely.

And once on the beach under the favourable circumstances of a fine day, a receding tide, sufficient refection in the basket to prevent an inglorious retreat for lack of food—what is the wisest course to pursue? To go straight down at once to as low-water as the tide admits of, and so gradually follow its retreat; or to indulge the very natural inclination to stop and gather the wash-up (*wreck*, or *wrack*) which may possibly be scattered at your feet? The answer depends upon circumstances, but, as a general rule, the first is decidedly the better plan for a sea-weed collector. Sunshine so quickly injures the greater number of the finer plants (fading them to yellow and white), that they are scarcely worth picking up after a few hours' exposure. But if a rough sea has brought an unusually profuse and thick deposit, they are well worth a turn over or two from your stick just to see that you are not leaving pearls behind you unaware; and if you are one of those who patronise zoophytes as well as algæ, you are pretty sure to find something worth stopping a few minutes for. Very good zoophytes are sometimes washed up to the very last high-water mark line, an instance of which once occurred at Filey, where a layer of the scarce *Thuiaria articulata* was left round one side of the bay, close under the cliffs.

In such cases, of course, the bird-in-the-hand principle must come into play. You must not leave the certain good thing behind you, lest you lose it; for, find what you may afterwards, you will fret about the neglected treasure. Secure it, therefore, but hurry on afterwards; and to beginners I would say, Go down to lower water at once.

And now, if you have to walk along the sands before reaching the rocks you purpose scrambling over, enjoy yourself thoroughly as you go, by keeping close to the sea; never minding a few touches from the last gentle waves as they ripple over at your feet. *Feel* all the luxury of not having to be afraid of your boots; neither of wetting nor destroying them. *Feel* all the comfort of walking steadily forward, the very strength of the soles making you tread firm—confident in yourself, and, let me add, in your dress. Verily we women are all, "more or less" (as sea-weed descriptions have it), at the mercy of our dress! It is an unpleasant truth, but a truth it is. Does it not require an actual effort of moral courage, for instance, to go to a dinner-party, when you know that *you* are by no means fresh from the hands of a milliner, but that other people are likely to be pre-eminently so? Can even a sense (which shall be granted you) of some internal compensating superiority prevent you feeling a little—just a little!—abashed, or "*dashed*," as the strong common phrase goes, by the consciousness that for you the last new moon's "*Belle Assemblée*" has been published in vain? Take courage and admit the fact! You may hate the particular fashion of the day; disapprove of it as a matter of taste; be quite aware that no artist, or, at all events, no high-art artist, would venture to disfigure his canvas by a representation of such Guy-dom. But yet—

"My Lord! we women swim not with our hearts,
Nor yet our judgments, but the world's opinions."

Well, well! "Pelham" said long ago that the world considered eccentricity in small things, folly; in great ones, genius. So a woman is right in not dressing differently from the world's opinion when she is in the world, if she can; and when she cannot she must bear the mortification like the heroine she is: for among women there are a good many heroines of whom the world knows nothing. But enough! Enough, too, that if costumed as I have described, you, loving disciple, are, at any rate for once, conscious as you step along, that you are in the right

dress in the right place ; that you could not walk where you are now walking but for *it* ; and that to walk where you are walking, makes you feel free, bold, joyous, monarch of all you survey, untrammelled, at ease, at home ! At home, though among all manner of strange, unknown creatures, flung at your feet every minute by the quick succeeding waves. Curiously fragile, paper-like, sea-urchins—you wonder if alive or dead—some mere empty cases, some heavy with the corpse within ; jelly- and star- fishes ; ridiculous little crabs, who find their legs at once, and trot hurriedly off ; and mixed with these, perhaps, the heavy body of a once-beautiful seagull, its life cut short by an idle shot ; and a thousand other things which must not be named or numbered here ; for, if you are a sea-weed collector only, you will not care to be troubled about sponges, zoophytes, or shells, nay, probably would not even notice them, for it is curious how the eye accustoms itself to see what it is searching after, and to ignore everything else. Any mother knows this who has walked down a wooded lane in spring with a schoolboy son. To her it is full of primroses, violets, and such matters ; to him of the birds' nests which, even when pointed out, she can scarcely distinguish in the thick green hedge. "None so blind as those who won't see," except, perhaps, those who are looking for something else.

But probably, as you proceed in your walk, you will observe that more and more sea-weeds are being left among the creatures on the sand, and, if so, by all means examine the nature of the wash-up before you pass on. If you see chiefly large lumps of the olive-coloured *Fuci*, such as are figured in the first four Plates, you need not trouble yourself. Pursue your way. But if delicate little tufts, pink or brown, are lying about, secure a few of each sort as nearly as you can guess at them, before you proceed. The initiated will, of course, have a definite idea of what to gather in such a case, and so will you—and soon become one of them—if you will now on this first occasion keep your random gatherings by themselves, so that on your return you may notice what it was you picked up. It is possible that all your little tufts may be but one species—that very common *Ceramium rubrum* (Fig. 242), which is a sort of Paul Pry in sea-weed society, intruding himself everywhere in many varieties of appearance. Or they may be altogether a mass of another common thing, *Plocamium coccineum* (Fig. 178), for as it looks very pink as it lies, you would be certain to pick it up, were it there. And sea-weeds are so often torn from the rocks in shoals, that it is very common to find a quantity of specimens of one thing together ; and as only an experienced eye can detect a species as it lies in a lump on the sand, beginners are sure to pick up more of a kind than they want. No matter, however, for your first gatherings, if you do but observe them narrowly afterwards, and so take in a lesson of increased wisdom for next day.

Moreover, "time and chance happeneth to all men," and your very first day's hunt may, by a happy accident,—waft actual treasures under your eyes. It is in vain to attempt to enumerate these, but let no very delicate hair-like tuft or flat pink plant escape you ; watch the wave that is throwing them ashore, and if it is for changing its mind and drawing them back, you must step in to the rescue and secure what looks to you the best, whether you wet your gloves, boots, or even petticoat, or not ! And then push on, for if good things are astir in this manner you will get at them still more easily a little further down ; kneeling on some low rock for instance, in some sheltered corner which you must look for, where the water is tolerably quiet, and you can see your pretty prey floating, displayed to the best advantage, and dip in a bare arm to catch it at comfortable leisure.

And here men have certainly an advantage over women, for they can wade with impunity :

but never mind; plenty can be done without it, if the loving disciple will but have patience with the waves, use her stick cleverly to assist the nearing of the plants, and separate them so as to observe their forms as they approach. She will thus soon learn to know the fairy *Callithamnion* bushes (Plates LVI. to LIX.) from everything else, and will push aside the coarser Paul Pry, *Ceramium rubrum*, for their more refined tufts; nay, could scarcely fail to recognise *Chrysymenia rosea* (now *Chylocladia rosea*, see Fig. 142) itself, even at first sight. But patience and enjoyment must go hand in hand here. To stoop down once or twice and then be weary, will not do. You must kneel, or sit, or recline on the rock, and fairly gaze on into the water as the waves waft the plants up and down. And if you have got into a good place, *i.e.* under shelter, and where fresh things are coming in, half an hour will scarcely be too much to remain, unless the tide is ebbing, in which case you must follow it to the next convenient resting-place.

Of course, to gather a plant growing is the orthodox perfection of sea-weed discovery, but these hints are especially intended for the comfort of the sisterhood who are hampered both in wading and climbing. And they may rest assured that some of the rarest and loveliest plants may be caught in the manner above described, and often as perfect and uninjured as if careful hands instead of reckless waves had detached them from the rocks. The truth is, the scarce low-water plants are apt to haunt very inaccessible places; places, too, where the roaring of breakers is so near at hand, and the standing ground so wet with spray, that a strong mental effort is necessary to keep the nerves and feet steady, even after the difficulties of getting there are surmounted. Not that the spot is unsafe for any one who is sure of a continuous self-command; but invalids sometimes become sea-weed collectors, and it would be madness to counsel women indiscriminately to be strong-minded above their condition. People can, however, do at one time what they cannot at another; and with a male companion to lend a hand and infuse a sense of security, a very *erie* hunting-ground may be sometimes ventured upon; yea, even within the splash and uproar of such heavy dark green waves as beat against the north side of Filey Bridge, the place of all others to which the above remarks specially refer. But "unprotected females" have no business to be running risks for the sake of "vile sea-weeds;" and, for their consolation be it known, that although that bewitching *Chrysymenia rosea* lurks in just such fearful corners, only attainable at spring-tides, and only uncovered then for a very short time, yet as fine a specimen as has ever been found of it was floated into a shallow tide-pool that formed round a large stone on the sands of Filey Bay!

But having said thus much for the happy chances which often attend *wreck*-gathering, as distinguished from *rock*-gathering, it is fair to add, that all low-water hunting-ground is not of the same inaccessible character. In flat open bays and shores, with rock-fields of moderate height, you have only to look out for not being surrounded by back-water, and may, if you are indifferent to noise and dreariness, prowl up and down the fruitful wet lanes that lie between the different masses, to your heart's content. Of this kind is the glorious coast to the north of Berwick-upon-Tweed, where hundreds of collectors might work together without ever interfering with each other, so great is its extent; and where, when beaten back by the tide, you find extensive upper caves, into whose shadowy pools the wreck has been floated unscathed and unfaded, and where you may pick it out for another hour or two longer. Into these caves come from time to time the tiny fronds of the scarce *Rhodymenia cristata* (now *Euthora cristata*, Fig. 184), as dear to an algologist's eye as a nugget of gold.

And somewhat of the same character (the caves excepted) is Gristhorpe Bay, between Scarborough and Filey, where (all but back-water) the only risk you can run, is of slipping by a false step into some of the enormous pools with which it abounds, and which are deep, though not always dangerously so. But there are such things as *happy accidents*, and it was a tumble into one of these sea-weed repositories which a few years ago revealed the then rather surprising fact, that the whole bottom of the pool was lined with fine large plants of *Odonthalia dentata* (Fig. 99); a species at one time supposed to flourish no farther south than the county of Durham. A "happy accident" this, were it only for the assurance it gives of how much remains to be done in the exploration of different localities!

But even in reflecting upon the best and easiest shores, such as the choice one of Douglas Bay, Isle of Man, for instance, it must be owned that a low-water-mark expedition is more comfortably undertaken under the protection of a gentleman. He may fossilize, or sketch, or even (if he *will* be savage and barbaric) shoot gulls, though one had rather not; but no need, anyhow, to involve him in the messing after what he may consider "rubbish;" unless, happily, he be inclined to assist.

Meanwhile let the loving disciple who cannot obtain such help, take things easy. It is a fine thing to get as far as you can, of course; but she will do sufficiently well, as has been shown, without straining the point. We could whisper to her of a shore and pools at St. Mary's, Scilly, where, without running into hazards or among *Laminaria* plants, she may deck herself over from top to toe with the crimson fronds of *Rhodymenia laciniata* (now *Callophyllis laciniata*, Fig. 179) and *Kallymenia reniformis* (Fig. 215), or the lighter rose-coloured ones of *Nitophyllums Hilliæ* and *punctatum* (Figs. 175, 174); even as the robins covered over the babes in the wood with leaves! And really, as a general rule, it would be scarcely possible to say that she has less chance of success in "treasure trove" from wreck-gathering on the shore, than more adventurous labourers from low-water-mark researches.

The long mass of rocks called Filey Bridge has been already mentioned; and one of its peculiarities, namely, its various *levels*, leads to a subject to which the attention of collectors should be directed; that is, the *zone vegetation of the sea*. By which is meant that certain particular plants, and even classes of plants, affect certain depths or levels of the sea. Thus, for instance, one may say generally that the grass-green ones inhabit the upper range or zone, and that the red prefer the lower, while different forms of the olive-coloured flourish the whole way through. In the following descriptions this point is always noticed; and it will be observed that, while some species confine themselves exclusively to one situation, others are to be found anywhere "between tide-marks;" varying, however, considerably in colour and even character of growth in different situations; the red ones always pale and discoloured near the higher zone. Thus, in upper pools, our friend *Ceramium rubrum* will be found a dirty stone-colour; in deep ones, a fine red.

Among those which maintain an unvarying position is the large Tangle or Oar-weed, *Laminaria digitata* (Fig. 24). It is never met with but at extreme tide-limits, where some of its broad, leather-like fronds may be seen darkly overhanging the rocks, while others, a little lower down, are rising and dipping in the water like sea-serpents floated by the waves. If ever you find yourself astray among *Laminarias*, therefore, you may conclude at once where you are, according to algological geography; namely, at extreme low-water mark; or, in other words, in the *Laminarian zone*. And, being there, it behoves you to remember that you may expect to

find all manner of good things growing in the neighbourhood, seeing that the finest red sea-weeds also love this deep water. Not that you must expect to see this lower region a fairy land of rosy colour, remember—often not half as much so as a wreck-scattered shore like that at St. Mary's. A delusion on this subject is encouraged by picture-books, from which the loving disciple must awake. Few red plants are as bright when growing as when laid out, though this rule, like all others, has its exceptions; but it is true of most of the species which afterwards prove so brilliant. *Delesseria sanguinea*, for instance (now *Wormskioldia sanguinea*, Fig. 169), does not acquire its fine cactus-hue till after it has been exposed for an hour or two to the air; and *Dasya coccinea* (Fig. 135), and *Plocamium coccineum* (Fig. 178), take a longer time still before they change from their original reddish brown to the cochineal tint their name implies. To find the former plant, therefore, you must look out for a delicately transparent and exquisitely formed leaf, rather than expect to be guided to it at once by a startling blaze of colour.

Besides all which, the beauties, whether bright or dingy, often hidè; and you will have to inspect the sides of the rocks most carefully, lifting up the great tangle plants to peep underneath them, if you would hope to see anything worth having. The most lovely of *Callithamnions* looks but a miserable little dab of pinkish mud, as you see it on a rock when the tide has left it, for how can it float and show itself there? And it is only by knowing and practically believing that everything is something, that you are preserved from passing by many such minute valuables in such situations.

In truth, with all due deference to bright pictures of deep sea-rocks, such Laminarian zone ground as one can get to, is often anything but attractive in general appearance. Nay, it is sometimes particularly dismal and gloomy-looking, owing to the masses of olive plants that abound there, and the saturated hue of the rocks. How it may be further down still, one cannot pretend to say. We shall know some day, perhaps, when *diving* for sea-weeds has become a fashionable amusement, and an indispensable part of an algologist's education, and collectors go forth singing,

"Come with me, and we will go
Where the rocks of coral grow."

But to return to our subject. When low-water mark affords you a long, flat, rocky level to walk upon, the case is decidedly better; for there you are sure to find pools, and some of these will be crystal basins, not thickly crowded and confused with plants, like those higher up, but exquisitely clean and refined, lined with a lilac-pink *Melobesian* incrustation perhaps, or graced at the bottom or sides by a few elegant tufts of, now and then, the exquisite little *Polysiphonia parasitica* (Fig. 128), or the deep green *Bryopsis plumosa* (Fig. 286), displaying their feathery forms to the best advantage. "*Exceeding in beauty the plants of the earth,*" exclaims Dr. Johnston, in a moment of enthusiasm, when speaking of the vegetation of rock-pools, at the conclusion of his *Botany of the Eastern Borders*. And the compliment has its value, though one knows the words were not intended to be taken *au pied de la lettre*.

Now, on leaving the Laminarian zone of Filey Bridge, you have the opportunity rarely afforded by one mass of rocks, of ascending gradually by a succession of, for the most part, square-cut levels, or ledges, each easy to walk upon, and abounding in pools, up to extreme high-water mark on the top; one part of which is only completely submerged at spring-tides, though always within the influence of spray. And here, as you walk over the fine old riddled

surface, nearly a quarter of a mile in extent, you have but to turn to the right hand, where some large blocks of stone rise up in a sloping position, and underneath the slope you may gather handfuls of *Catenella opuntia* (Fig. 204), as you stand; while in the adjoining pools the grass-green *Enteromorphas* (Plates LXX. and LXXI.) come, obedient to the zone law which gives them the upper level as their peculiar habitat.

Nor are the intermediate levels—hanging-gardens, as it were, of the sea—between high and low-water mark, difficult to be got at, if only you have remembered to put on a strong pair of gloves, and will condescend to use hands as well as feet to ensure your safety. But by this time there is no doubt the disciple will have become as reasonable as nature intended her to be—will have realised the wisdom of wearing woollen petticoats among wet rocks, and thick boots when she has to walk over beds of *Fucus vesiculosus* (Fig. 10), and *Himanthalia lorea* (Fig. 16).

As to the hanging-gardens themselves, they afford a good opportunity for a minute study of zone vegetation; but this is a subject for the more advanced student, who can open Dr. Harvey's works and follow him in this and other interesting discussions. And now, even among the pools, the old rule holds good—the prettiest things are not to be got at without trouble. The disciple will have to kneel or sit down on the rock and lift up the coarser plants which often fringe the edge of such places, and look underneath for delicate *Corallinas* (Plates XXXIII., XXXIV.), *Polysiphonias* (Plate XXVI., &c.), and other scarcer things, or she will come away knowing nothing of the pools at all. But, alas! here is no space for fully pursuing this subject. Only remember that the perpendicular faces of rocks have their growths as well as the pools, and that a good collector must, like a good nurse, keep her eyes open all round her; while, on the other hand, the injunction cannot be enforced too strongly, that she had better go home hurriedly than overload her basket and spoil everything it contains.

It will be understood, of course, that what has now been said of Filey Bridge applies to other rocky shores, although the zones of growth are more easily observed there than elsewhere. But they exist everywhere—everywhere grass-green is the earliest life in the first vegetation-line; mixed gradually with some of the more delicate olive plants, *Ectocarpus* (Plates XIX. &c.), *Asperococcus* (Fig. 46), &c. Everywhere the *Laminarias*, and the rarer red plants, are to be found only at low-water level, but the popping sea-weeds, the *Fuci* (Plates III. and IV.), throughout the whole range, save only the extreme last. Exceptions excepted, an examination of any shore will prove these statements correct, and enable the collector to judge whereabouts she is, algologically speaking, on even a perfectly strange coast, and to regulate what she looks for, accordingly.

Another subject of interest to the algologist is the influence of climate on the growth of special plants, for this may often decide her in a choice of stations. Sea-water varies very much both in temperature and saltness, and it would be as unreasonable to look for Devonshire myrtles in Yorkshire gardens as for Devonshire algæ in its waters. But here latitude is not everything. Douglas Bay, in the Isle of Man, is in nearly the same latitude as Filey, yet both the land and sea vegetation are very different; and if it be asked why, no reason can be assigned but *Gulf-stream influence*. The point is open to discussion and objection, perhaps; and there is a theory (with a diagram in its favour!) of a current which diverts the Gulf-stream from going further east than the Scilly Isles, and prevents its going up the Irish Channel at all, while it allows its influence on the west coast of Ireland. But if this be so, how is it that the blue

snail shells (*Ianthina fragilis*) and Portuguese men-of-war (*Physalia pelagica* and *Verella spirans*), which it is universally admitted are drifted to Ireland and Scilly from hot latitudes by the Gulf-stream, are also found along the coasts of Cornwall and Devonshire? Surely this diverting current off the Scillys is rather a mythical idea? Moreover, it is not Captain Maury's belief, who figures his lines of influence as extending not only up the Irish Channel, but a few of them along the south coast of England and slightly north-east beyond, until lost in the stronger downward current from the North Seas.

People may adopt which theory they like best, but those who have seen the coast of County Clare, the Isle of Man, and the north-east shores of England, will have a strong leaning towards Maury's creed. It solves all the difficulties presented to them by the different appearance of the waters in those places, and the different vegetation to be found in them. Sea-weed collectors need only be told that *Sphaerococcus coronopifolius* (Fig. 191) exists at Douglas, and *Odonthalia dentata* (Fig. 99) at Filey, to be aware that there must be some very decided cause to account for so great a difference in the growths of two places in the same latitude. And many other warm-sea-loving plants occur in the Isle of Man which are quite unknown on the north-east coast, as *Bonnemaisonia asparagoides* (Fig. 133), *Callithamnions plumula* and *thuyoideum* (Figs. 254, 275), *Naccaria Wiggii* (Fig. 218), *Chylocladia* (now *Lomentaria*) *kaliformis* (Fig. 146), *Griffithsia corallina* (Fig. 252), and who knows how many etceteras, if one could but get at accurate information?

A limited visit to one locality goes but a small way towards an acquaintance with its treasures; and it is to be wished that more was ascertained about that unusually charming island, with its soft climate, blue sea, bad farming, bare-legged, begging population, beautiful scenery, remarkable antiquities, and last, not least in love, its exquisite sea-weed shores.

Would that some one might take this hint! for if more efforts were made towards announcing individual experiences on different coasts, a large amount of testimony information would be secured, which at present dies out and is lost.

A few words remain to be said about the descriptions of the Plates which follow; the most important being an assurance to the reader that he is secured from the danger of meeting with serious errors, by the fact that private friendship has enabled me to consult Dr. Harvey from first to last throughout, as also to make use of his various works. Those works are intended for scientific or, certainly, *advanced* students, and any one who will compare his descriptions with mine will discover that what I have done—or rather what I have attempted to do—is to bring his scientific statements within the range of general comprehension by such alterations of language as might soften the technical difficulties which are such a stumbling-block to amateur beginners.

Should any one, from looking at these descriptions, desire to rise out of amateurship into science, he will seek and find his proper food elsewhere. The books are open for those who can understand them, and those will understand them who care sufficiently to try, and will find the pursuit a charmed one. So that to have assisted in whetting the appetite of any worthy disciple in favour of it would be a fact to reflect upon with pleasure, and make the labour bestowed on these pages seem well employed. And who can doubt that those who desire to take the higher flight, will be all the better able to do so from having condescended to begin as children, and work upwards by childish steps?

They may laugh hereafter, perhaps, at ever having looked at a book which translates *ramuli*

into *branchlets*, and *ramelli* into *branchleteens*; but it will be in the same way that grown-up people smile at the spelling-book which enabled them to begin literature by stories of one-syllabled words. By the time my amateur beginners have learnt to know that *ramelli*, as *branchleteens*, are distinct from *ramuli*, as *branchlets*—have seen *threads* explained as *filaments* so often, that to forget what *filaments* mean is impossible, with other similar lessons—they will look at the pages of Phycologias, British and Foreign, with comparatively open eyes, and on their own heads will it be if they do not persevere further!

Moreover, it is believed that the plan here adopted, of arranging the *subjects* of observation in separate lines and in uniform order, will facilitate the necessary comparison of species with species. Thus, at a glance, *colour* can be matched with *colour*, *substance* with *substance*, *form* with *form* (under the title *Character of Frond*), &c., and a plant referred to the one with which it proves to agree.

It is true, the absence of scientific *generic* classification and headings makes it difficult at first to discover to which *set of species* a plant may belong; but, to meet this difficulty, two attempts are now made; one of which is to throw brief *generic* and *specific* distinctions together in the descriptions. Thus, on the first page, in the account of the *Sargassums*, the statement that they have “branches bearing distinct leaves” is made of both, and is followed in both cases by a more particular description of the leaves. Now the fact of “bearing distinct leaves” is a *generic* character, and separates the *Sargassums* from all the other plants that follow; whereas the minute differences as to *width*, the presence of *pores* in the leaves, &c., are among the *specific* ones which distinguish *S. vulgare* from *S. bacciferum*.

So of the *Polysiphonias* (Plate XXV., &c.), the true *generic* characters, that they are *thread-like*, and that the threads are *jointed*, and that the joints are marked with *upright lines* (internal tubes seen through), are repeated under each species; while the *specific* distinctions as to the *number* of tubes visible, the more or less obscurity of the joints, and other matters, are added to each.

But, besides this, in the second place, there will be found appended to this volume a *Synopsis of Sea-weed Appearances*, which it is hoped will be a great assistance to the collector in tracing any plant he may meet with to its *generic*, and, finally, its *specific*, home. In this the *first* step towards algological classification is as clearly marked as in the most scientific works, viz. the division of *algæ* into three chief colour-groups,—olive, red, and grass-green: * but this stage over, scientific classification is laid aside, and the plants are grouped together by the more obvious characters of form and habit of growth. To begin at the beginning, however. The first inquiry of a collector must still be—Is my plant olive, red, or grass-green? And this he must find out whenever he wishes to ascertain its name. In most cases it will be easy enough to do so, but in others he can only accomplish it by holding up the plant to the light, or by examining it through a pocket lens (a magnifying-glass used by all botanists, and to be carried in the pocket); or, better still, under the microscope. And here he must bear in mind that all *algæ* are coloured one of the three colours named, unless faded by exposure. The tempting white bits so common on the shore near high-water mark, therefore, are worthless, except to make a variety of appearance in a sea-weed picture or basket.

* Not that the colour-groups are so arranged *because* of colour, but because of structure; consequently, in the few cases where colour and structure clash, colour gives way. Hence the exceptional *red* cases in the grass-green group, where the structure is strictly that of grass-green plants (Figs. 345 to 350.)

The colour ascertained, he now knows in which of the three colour-groups to look for his plant, and may proceed next to consider to which of the principal *divisions* of its group it belongs; whether to the FLATS, the CYLINDRICALS (*i.e.* those *shaped* like a thread, whether coarse or slender), the INCRUSTATIONS, OR IRREGULAR LUMPS. Then—if flat, for instance—he must go on to observe whether it is *with or without a midrib*; whether *leaf-like* or *irregular* in shape; whether *branched* or *unbranched*, &c.; for it is impossible to do more here than give a general idea of *how* the investigations are to be pursued. They will need patient labour and careful observation; but if these are given they will probably be successful. What the *Synopsis* fails to give, the specific descriptions and plates will probably supply; and the List of *Families, Genera, and Species*, which follows, will enable the student to reduce his scattered materials into their proper order, and arrange his plants in the herbarium according to their scientific classification.

It is true the difficulties increase as the inquiry proceeds. It is easier to find the generic than the *specific* name of a plant; to trace it home to its family, than to identify it as an individual. But those who have accomplished the one are little likely to rest satisfied without attempting the other. And if a real difficulty occurs, surely some more advanced naturalist-friend can always be got hold of to throw light on the subject. For brotherhood is strong among them—especially among the highest—whose readiness to help the ignorant, even at the expense of much valuable time and trouble, is an example which all will do well to imitate. On the other hand, the “*ignorant*” should carefully guard from presuming on such good nature. A habit of recklessly sending unexamined specimens to be named—a dozen of one sort perhaps—cannot be too strongly deprecated. But a real difficulty, which the possessor of a plant has tried in vain to surmount, is sure to be kindly and considerately met by any one to whom reference is made.

Very little more remains to be said, except on the subject of *microscopic examination*. In the course of these descriptions, especially in the latter ones, certain characters of plants, or the plants themselves, are described as microscopic objects. And it was necessary to state this, in describing such species as are only distinguishable from each other when observed through a power of the microscope high enough to reveal internal structure (see Plates LXXVIII. LXXIX. and LXXX.). A microscope, therefore, is one of those desirable possessions which almost amounts to a necessity, and is absolutely such to a student who intends to investigate thoroughly for himself. The internal tubes of a *Polysiphonia*, for instance (Plate XXV., &c.), cannot be seen without it, any more than the differences among *Lyngbyas*, *Microcoleus*, *Oscillatorias*, *Monormia*, &c. (Plate LXXVIII., &c.). And in days when an actually useful instrument may be had for 10s. 6d., and very good ones for a few pounds, it is to be hoped that few will be unable to afford themselves the luxury of such an assistant. For a luxury that is, indeed, which will so often resolve perplexing doubts by a glance, and save many weary hours of uncertain labour.

Connected with the microscope is, of course, the subject of examining plants by making sections of them. The Germans call a section a *durchschnitt*, or *through-cut*—expressively enough; and this *durchschnitting* is a necessary accomplishment to an advanced, *i.e.* a *scientific* student. Some *genera* even are wonderfully alike, till a *durchschnitt* reveals a difference in internal structure; when, behold, plants which might be taken for twin brothers have to be separated as wide as the poles, and the fructification of algae can never be *understood* without

such minute dissection. And although in these descriptions internal structure is not really entered into, except in cases which are visible by simple observation under a microscope, necessary allusions to it have been occasionally made,* which seem to render it desirable to add a few hints upon the art of making *durchschnitts* properly. These, therefore, are appended to the Rules for Preserving and Laying out Sea-weeds, so that beginners may be at no loss how to proceed in either of these matters.

In conclusion, it is quite possible that the students who read this book may, from time to time, and here and there, find imperfections in the accounts, or think of some happier way or words in which the meaning might have been expressed—I could probably do so myself were the printing to recommence. But of one thing they may rest assured,—the work has been in the strictest sense a labour of love. It is scarcely too much to say, that in all the 384 descriptions there is not a line of mere heartless copying or scissor-work. In all cases, my endeavour has been to understand the scientific statements myself before attempting to make them comprehensible to others. The labour of love, therefore, has also been conscientiously performed; and if those who have improvements to suggest will insert them in their own copies, and make them known to their friends, further assistance will be gained towards the clearing and *really* popularising one of the most charming studies which, in the goodness of God, this wonderful earth affords to its inhabitants. Only let natural history be pursued with the “reverence” on which our great poet insists, so that we may not become conceited with our beautiful but imperfect “broken lights,” and we shall find in it a fountain of perpetual enjoyment, and a resource against thousands of the lesser and often foolish disturbances of life, which otherwise are so apt to lay too keen a hold upon the mind, especially of those who lead quiet, uneventful lives. What saith the Book of Wisdom? “By the greatness and beauty of the creatures, proportionably the Maker of them is seen;” and to dwell on Him in the glory of His works here, is beginning to do in a lesser degree now what we hope to do in the full perfection of knowledge hereafter.

* As in the characteristics of Family XIV., *Squamaria*, &c.

RULES

FOR PRESERVING AND LAYING OUT SEA-WEEDS.

WHENEVER it is possible sea-weeds should be laid out on paper, and put under pressure the same day they are gathered ; but as this is not always practicable, especially to lady-collectors, who have friends' convenience to consult, and other matters to attend to, it is well to point out the two other methods by which shore-gatherings may be kept tolerably safe, until the laying out can be accomplished. I shall call one the *damping* process ; the other is called *rough-drying*.

The damping process is chiefly for cases of emergency, although it can be made available for the complete drying of plants if carefully repeated. Now one of an amateur-collector's emergencies is, when, in the course of travelling in an orthodox-touring hurry with non-naturalist friends, she has collected a basketful of plants on the shore, but has neither time nor opportunity for even rough-drying them—much less for laying them out ; and the question arises, What is to be done with them ? for they will soon decompose and become worthless if they are allowed to lie long together in a mass.

Well, let her travelling-bag always contain two or three old towels—soft thick ones are best—and at the first ten minutes' opportunity let her deal with the sea-weeds as follows :—

Spread one of the towels on a table or the floor, and scatter a few plants in a row across it, near one end, but leaving enough of towel beyond to fold over the plants. When so folded, scatter a second row on the fold itself, remembering in all cases to spread and separate the plants nicely, so that they may not lie too thick. Then double this fold over so as to cover the plants, and proceed to scatter a third row as before ; then fold it over, and so on again till plants and towel are formed into a sort of roly-poly pudding ; the towel answering to the paste, and the sea-weeds to the sweetmeat. It will be a dampish bundle, but, wrapped in a dry towel, it may be stowed away in a bag, or covered up in the sea-weed basket.

It is to a well-known algologist, my friend Miss Cutler, that I am indebted for these hints, and as the plan was practised by her in my behalf on the occasion of a hurried visit to the shore at Exmouth, and many of the plants were laid out successfully the following day, I have no hesitation in recommending it in cases of inevitable hurry.

Rough-drying has other advantages, and is performed as follows :—Spread three or four newspapers on the floor of an airy room, or in any airy situation, so that it is not exposed to the full blaze of the sun ; for, as before explained, sunshine takes the colour out of sea-weeds.

On these newspapers scatter, as lightly and thinly as possible, your fresh-gathered plants, just as you brought them in from the shore. For you must neither squeeze them nor rinse them in fresh water, nor do anything, in short, to get rid of the sea-water which hangs round them, and which, if you will allow it to dry naturally upon them, will both preserve them sound and keep them pliable, so that they will easily remoisten. If they are very dirty indeed, you may send for some clean *sea*-water and shake them in it, so as to get them into a state of average cleanliness before scattering them on the newspaper. But, even then, no squeezing or dabbing is allowed. Shake them once or twice if you please, if they are streaming as you lift them from the basin, but that is all.

Now, in warm weather, and in a dry place, and with plenty of air, your plants will soon begin to dry a little. And if you like to turn them over after an hour or two, there can be no objection, for there is no reason why the hay-making principle should not be useful here, and both sides of a sea-weed have the same chance. Even with turning, however, and that more than once, it is uncertain how long your plants will be before they are sufficiently dry for packing. Sometimes—but not often in England—a few hours will suffice; at others, a few days will be necessary. The artificial heat of a room may be used now and then to assist the operation, but it must be done in moderation. When tolerably dry—sufficiently so for there to be no danger of their clinging together and moulding, you may drop them into paper bags, ready to be packed up when next you start. And the word *drop* is used, to make it thoroughly understood that they must be allowed plenty of air-room, and on no account be pressed down to get them into a small compass. And the same loose packing must be practised with the bags themselves. The plants will not bear squeezing.

This rough-drying process is perfect for all the coarser plants, and answers very fairly with so many of the others, that you cannot do better than practise it wherever you go. For, even when able to lay out some plants at the time you collect them, it is always pleasant to have a few more after you come home, whether for yourself or for giving away, and such paper bags of sea-weeds travel nicely in a hamper, and are very light.

And the plan is invaluable for another reason. It is so easily carried out, that you may even venture to ask non-naturalist friends to practise it in your behalf, if either living or travelling in other countries. And in this way your collection may be enriched by some of the curious and beautiful growths which exist in distant seas. For algæ preserved in this manner remain in good condition for a length of time, and all but the *very* delicate ones will bear wetting and being laid out at leisure, quite well.

There remains now to be considered the process of *laying out*, which, be it remembered, when well done at first, is the one *sure* way of preserving algæ in perfection.

It is a rather complicated operation, but soon learnt, and easily practised, when once understood. Some little contrivance is necessary, however, to avoid annoying other people and injuring furniture; and a luxurious algologist would like to have a room to himself, with a carpet that would not stain, and a deal table which no amount of splashing would spoil. But it is wonderful what may be done without luxuries! I have known it possible, even when visiting, to lay out plants in a bed-room, washing them in a basin, spreading them in any shallow bath that happened to be there, and pressing them under a travelling box, neither wetting the furniture nor doing anything else to annoy the hostess, and causing no extra trouble but the emptying of the bath once oftener than usual.

This is rough work, though, and seldom necessary. In any house you may, by asking, have the use of a common table, or cover a better one with oil-cloth, and so also the floor. You must then have ready a largish bowl and three moderate-sized meat-dishes—if white, so much the better. Also some fine white “medium” cartridge or drawing-paper, previously cut into three sizes, so that there may be uniformity in the appearance of your collection. Also an ample supply of blotting-paper (the cheap sort is sufficiently good), and of well-washed muslin (the commonest kind of book-muslin) cut into slips of folio-paper size. You require also a camel’s-hair brush for cleaning the plants, and a porcupine’s quill or ivory knitting-needle, or something pointed, for separating fine branches and spreading them delicately on the paper. A pair of scissors, too, for clipping overthick specimens; a pair of pincers for lifting them about; and, finally, *plenty* of both sea and fresh water. Of course, too, there should be a puncheon at hand, to receive the water in which you have been laying out your plants, the moment you observe it becoming dirtied or discoloured; for, without the strictest attention to its cleanliness and purity, the paper on which your specimen is spread will be stained, and remain an eyesore for ever.

And now, with all these appliances around you, begin your work by *washing* your plants. For which purpose put a dozen or so into the *bowl*—those first which you may have brought home in bottles—and pour sea-water on them. Do not overcrowd the bowl, or you cannot see what you are about. With a moderate number you can take them up one by one and shake them a little in succession. Then place one in a dish with sea-water, and, drawing it to you, observe its condition as to dirt and mussels, which often infest sea-weeds. Brush it over carefully with your camel’s-hair brush to remove the dirt, and if the mussels will not move, *press* them off with the end of the porcupine’s quill. When you are satisfied that the specimen is clean, remove it into dish No. 2, still floating it in sea-water, and there let it remain till you have prepared several others in a similar manner; for it does not do to go backwards and forwards from one part of the process to another.

When you have got from half-a-dozen to a dozen plants (dependent on their size, for they must never be crowded) in dish No. 2, push the first dish away and bring the second close. The plants are all clean, it is true, but you have now to consider, as you see them floating in the water, whether they will look well when flattened by pressure, or whether any bushy ones among them may not be improved by a little thinning. If there are branches springing from all sides of the stem (*quadrifariouly*), as in the cases of *Callithamnion arbuscula* (Fig. 262), and *Chrysmenia* (now *Chylocladia*) *clavellosa* (Fig. 136), your *laid-out* frond will form heavy lumps here and there, and its beauty will be lost. Unpleasant, therefore, as it is to clip any luxuriant growth, it is desirable to make the sacrifice, and to cut away some portion of the branches, that the rest of them may be seen to advantage.

But there is still a difficulty before you. There are some plants which will not bear even the touch of fresh water, and which, therefore, must be laid out, as well as cleaned and prepared, in that from the sea.

Polysiphonia Brodiaei (Fig. 120), for instance, begins to decompose at once in fresh water, and were you to attempt to lay it out therein, you would see all the fine tips of the branches breaking off under your brush, till it became comparatively quite stunted. So also *P. fibrata* (Fig. 113), *P. violacea* (Fig. 119), and *P. fibrillosa* (Fig. 123). But this last is almost worse, for it decomposes so rapidly under any circumstances, that only laying it out at once saves it

from destruction. The *Griffithsias* (Plates LIII., LIV., LV.) are nearly as bad. What they do is to crack and let out all their fine pink colouring-matter, so that, although they do not rot in pieces like the more fragile *Polysiphonias*, they leave you nothing but their faded forms to remind you of your mistake. And much the same may be said of *Callithamnion Borreri* (Fig. 272), *Wrangelia multifida* (Fig. 249), *Gloiosiphonia capillaris* (Fig. 219), which also decomposes; and *Nemaleon multifidum* (Fig. 217), &c. Nay, even the common *Ceramium rubrum* (Fig. 242), if long soaked, will serve you the same trick, while *Nitophyllum versicolor* (Fig. 181) changes from rose-colour to orange. And there are other species similarly affected, all of which should, by rights, be laid out in their native element, and attended to as soon as possible.

The necessity of washing the general collection in sea-water is therefore obvious. The almost certain result of plunging a dozen plants at random into the other is, that before ten minutes are over *some* of them would perish, discolouring the whole mass of water and injuring any delicate companions.

It must be borne in mind, that as the above list does not comprehend *all* the fragile plants, the collector will do well to make experiments upon those with which he is not acquainted; and if he loses a few plants by a few mistakes at first, do not let him grudge them. The lesson of knowing better next time is a good thing in exchange.

On the other hand, there are certain plants which *improve* by being steeped for some time in water from the well. Of this sort are *Dasya coccinea* (Fig. 135), *Plocamium coccineum* (Fig. 178), and *Laurencia obtusa* (Fig. 132), provided that they are still the brownish-red tint of complete freshness when you begin upon them. If from exposure on the shore, or in your basket, they have already turned the beautiful cochineal colour you wish them to be, the object of soaking them is effected. The next process will be decomposition and fading, so lay them out while they are pretty, in whichever water you have at hand.

And the operation is the same in both cases. Put dish No. 2 on one side, and place dish No. 3 before you. Pour into it whichever water your plant requires, and lift your plant in from dish No. 2. Then take a piece of the ready-cut paper, of the size that will allow you a handsome margin round it, and slip it into the water underneath the plant, keeping just hold of it on one corner with your left hand. Then with the porcupine's quill or camel's-hair brush in your right hand, help the plant to arrange itself gracefully on the paper, and when you are satisfied with its position, begin drawing it carefully and gently out, taking care that it is properly displayed, and brushing away any atoms of dirt that may appear on the water. It will be, of course, during this operation in a more or less sloping position, for the shallowest dishes have sides; and you will have to take care, especially if it be a gelatinous plant, that it does not slip away suddenly, and rush back into the dish. But a little practice soon enables the disciple to manage this part of the business. Like bringing a trout to land, it has its difficulties; but if you love your plant as Izaak Walton would have Piscator do his fish, you will bring him to at last. Here, however, I must mention a rather new device for rendering this part of the laying-out process much easier. It is the use of a very thin plate of zinc, perforated with small holes; which, being placed in your dish—one end supported by the ledge, the other plunged in the water—forms an inclined plane, over which it is comparatively very easy to draw out the paper with the plant upon it. The material may be bought at a trifle per yard at any wire or metal shop, and you can have it cut to what size you please. Of course

it must be the length of the dish in use; and an oblong shape; with one rounded end, is desirable. The advantage gained is that the paper can no longer bend, which it is otherwise apt to do in a treacherous manner, as you draw it over the edge of the plate, the metal plate keeping it flat throughout, while the holes allow the water to drain away.

What has been so long and successfully done without, can, of course, be done without now, but both time and trouble are saved by this simple invention, and it is within the reach of every one who will take the trouble to procure it.

On the removal of the paper with the plant upon it from the water, it may be either laid at once upon sheets of blotting-paper (four thick), or you may place it for a short time on a linen cloth or sheet, spread over another table, or the back of a sofa, or even on the ground. This is merely to absorb a little portion of the water, and I believe the plan to be a good one, inasmuch as it prevents the mass of blotting-paper from the excessive saturation it otherwise must undergo.

And now leave it, and proceed in the same way with more plants till you have enough to cover the whole sheet of blotting-paper; and when they are all neatly laid side by side, but not touching, upon it, cover them with one of the pieces of muslin already spoken about. On the top of which muslin place four more sheets of blotting-paper, and then you have a fresh dry surface on which to lay another batch of plants similarly prepared and treated. And proceed in this way till you have raised a bundle—it may be even six or eight inches thick—of alternate blotting-papers, plants, and muslin. Which bundle place between two flat boards, weighting the top moderately; or if in a clothes-press, be careful not to screw it *tightly* down. This is an error into which beginners are very apt to fall; but it may be here laid down as a rule, that except in dealing with the stiff, unruly, *leathery* olive algæ, strong pressure is never necessary, and often most objectionable. If it does nothing else, it stamps the texture of the muslin both on paper and plant, disfiguring the one and destroying the character of the other. Neither does it ensure the *flatness* of the paper to squeeze it in this violent manner. Permanent evenness and flatness are produced by *continued* moderate pressure—*continued*, even after the drying seems effected.

At the end of five or six hours take the bundle from between the boards, remove the top sheets of blotting-paper, lift the muslin most carefully off the sea-weeds, and then proceed to place them on other dry sheets of blotting-paper as before. And in most cases it is well to repeat the muslin cover also. Do the same, of course, to all the layers in succession, and put the new bundle between the boards again; this time with a rather heavier weight, and there leave it for half a day; after which, change the blotting-papers once more, but the muslin will no longer be required. Weight them again between the boards, and leave them for one, two, or three days, as is most convenient, by which time they will appear perfectly dry. Nevertheless, it is no bad plan to change them once again, putting them now in *single* sheets of blotting-paper. Then replace them between the boards, and then—*forget them*, if possible; for the longer they remain in press the firmer they will be, and the less liable to curl.

Thus much for the process generally; but one or two remarks must still be made. Very coarse and very delicate plants must not be mixed in the same bundle. The former need strong pressure to get them tolerably flat. *Fucus* (now *Fucodium nodosum*) *nodosus*, (Fig. 13), for instance, with its large thick air-vessels, would ruin several layers of delicate plants, as its impression could not fail to be forced through the damp blotting-paper. The same remark

applies to the *roots* of plants, which are fatal to their neighbours when pressed in. It is always desirable to possess the root, but let it be trimmed and subdued as much as possible, and where inveterately troublesome, kept at the outer edge of the sheet. Coarse and fine plants must be arranged in separate bundles, therefore, and placed in a different press, or with a dividing board between, and roots must be made as little offensive as possible.

Again: as to the recommendation of blotting—rather than botanical drying—paper, as a soaking medium; this is made on account of the much smoother surface it possesses. The inequalities of botanical drying-paper always become more or less impressed upon the damp sea-weed papers on which they lie, and as this is inevitable even under moderate pressure, and is decidedly disfiguring, blotting-paper is much to be preferred.

Then, in speaking of the laying-out paper, let me protest warmly against the use of anything blue-tinted, however good otherwise it may be. A rose-coloured sea-weed on blue writing-paper loses half its beauty, as the general effect produced to the eye is a muddled lilac hue. Indeed, on the perfect whiteness of the paper employed, half the perfection of the specimen depends, for it can only be seen properly on such. The fine-grained white “medium” cartridge-paper spoken of is sufficiently good. But better still, and very reasonable in price, is to be had at Saltcoats, in Ayrshire,* if the sending to a distance be no objection. At any rate, the paper used must be smooth and milk-white, if the specimens are to be displayed to their best advantage.

Now a few words upon special plants. The “tough, leathery,” olive ones, *Sargassum*, *Cystoseira*, *Fucus*, &c., should be soaked for an hour or two in hot water before being laid out and pressed, as they are thereby rendered more pliable. They may be fastened to their papers at last with gum, as they do not adhere naturally. Most of the finer plants adhere naturally, but the coarser ones, which do not, may be fastened down by glue; the finer by gum tragacanth paste; or by washing both specimen and paper over with *skimmed* milk, applied by a varnish brush.

Delesseria (now *Wormskioldia*) *sanguinea* (Fig. 169), preserves its colour better when the wet blotting-papers are changed very quickly.

Mesogloia vermicularis (Fig. 55), and *virescens* (Fig. 57), *Gloiosiphonia capillaris* (Fig. 219), *Porphyra laciniata*, and any very gelatinous plants, should never have their *muslin* removed under any of the changes of the blotting-papers: not, in short, till they are completely dry.

Several of the thin flat expansions, as the *Rhodymenias*, *Nitophyllums*, *Iridæa*, *Rhodophyllis*, *Callophyllis*, *Kallymenias*, *Halymenia*, *Ulva*, &c., contract so much in drying, that ample allowance should be made for it, by laying them very easily on the paper—never stretching them to anything like their full *wet* length. Otherwise, when dried, they will crack in all directions. Rough-dried specimens require the same treatment as fresh ones, except that they will need soaking to induce them to expand. The coarse olive plants should never be left soaking with finer ones, as they give out a slimy juice.

Codium bursa (Fig. 284) is a specialty, and must be specially treated. It is a thick lump, and must be pressed alone and very gradually, or the frond will crack and burst; the pressure being increased day by day as the lump subsides. It may be made quite flat at last, but time

* Of Mr. Arthur Guthrie, Bookseller, Saltcoats, Ardrossan, Ayrshire. It was kept by him cut in three useful sizes, under the direction of the late Dr. Landsborough, and is still kept for sale.

and patience are necessary. If two or three growing in a close group are pressed together, put little bits of muslin between them, and do not remove these till the process of pressing is completed. Some people prefer preserving it in a bottle with spirits of wine and water (one part spirit, two water). This plan has the advantage of not destroying its shape, but the bottle is inconvenient in the herbarium.

Leathesia tuberiformis (Fig. 54), and the *Rivularias* (Plate LXXV.), require gradual pressing also.

Certain *incrusting* plants, as *Ralfsia verrucosa* (Fig. 60), *Cruoria pellita* (Fig. 227), (now *Petrocelis cruenta*), *Hildenbrandia rubra* (Fig. 161), &c., cannot be *displayed* on paper. Morsels of them may be kept in little paper cases fastened in the herbarium, but dissected portions of each should be mounted in microscopic slides for observation of the structure.

The *lumpy Melobesias* (Figs. 156-159) can only be kept in boxes.

HOW TO MAKE SECTIONS OF ALGÆ FOR MICROSCOPIC EXAMINATION.

For making sections or *durchschnitts* it is necessary to have a small working microscope, a few glass slides and thin cell-covers, and a delicately fine knife.

An excellent microscope of the proper sort is to be had for a few shillings; and if the knife it contains be not sufficiently fine, an infant's gum lancet, well sharpened, answers the purpose.

The little instrument has, of course, a stem on which the eye-glass runs up and down; and this being fastened to the wood-work of the box, can be shut in or turned out at will. When turned out, the box itself forms a small stage or platform to work upon; the student looking down upon it through the glass. Note here, that it is well to gum a piece of white paper on the stage to begin with, as the operations to be performed are thus more easily seen. On this stage place a glass slide, and on the slide place a morsel of the plant to be examined, say a quarter of an inch or so of a stem or branch. Hold this scrap firmly down to the slide by the first finger of your left hand, pressing the nail against its extreme end, so that as you look through the eye-glass you can only see the *merest edge* of the plant. Then, with the knife or lancet in your right hand, slice off this *mere edge* (the thinner the slice the better), and drawing the left nail very slightly back, leave another *mere edge*, which cut off in a similar way; and so another, and another, and another, till you have six or eight slices on your slide.

Now wet the tip of a finger in clean water, and let down one *small* drop thereof upon the centre of the slide; into which minute pool coax your little *durchschnitts*, by the aid of the small *pointer* contained in your microscope box, and then — replacing the slide on the stage — give yourself the pleasure of watching the magnified slices expand in the liquid.

With fresh-gathered plants there is no difficulty, of course, but sections of dried specimens are occasionally troublesome, by refusing to resume their natural shape. A drop of muriatic acid will sometimes induce them to open, but not always. Nevertheless, it is so rarely possible to mend the matter by moistening the dried specimen *before* it is cut, and clean, good sections are so much more easily made of dried plants than of re-moistened ones, that the *rule* is, to cut them in their dried state, as a first effort, and resort to other expedients, if necessary, afterwards.

But to proceed. The sections being more or less expanded, take one of the thin cell-covers (ascertaining that it is clean and bright), and let it gently down upon the slide over the little pool and its contents, and you have at once a *microscopic slide* ready for examination under your compound microscope.

Troublesome as this operation may seem to be, when read of, it is a very amusing one in practice, and by no means hard of accomplishment. *Longitudinal* sections are made in the same way; but it is always well then to secure a *fork* in the branching, as the one stem can be held down quite firmly while the other is being cut; whereas one only, if very slender, cannot be thoroughly secured during the process of cutting.

Were the mechanical part now described the worst difficulty in the examination of sea-weed structure, all the world might be made learned by algological *durchschnitts*; but the delicacy of eye and judgment requisite for understanding the meaning of what is seen, is a part of the matter not so easily taught or acquired. Courage, however! A comparison of fresh-gathered and dried *durchschnitts* of the same *genera*; a habit, if possible, of making drawings of everything one sees; and a patient acquiescence with the necessity of being twenty times mistaken at first for every once one is right, will go a long way towards making a *scholar* in its secondary sense, out of a mere scholar or amateur.

THE AMATEUR'S SYNOPSIS.

OLIVE SEA-WEEDS. (*Melanosperms.*)

FLAT.

— with a Midrib.

Leathery; slimy.

Narrow; branched in a forked manner; air-vessels, inflations in the frond

<i>Genus.</i>	<i>Fam.</i>
FUCUS	I

Membranaceous.

Narrow; forked; marked by dots (when in fruit)
 Long; narrow (in proportion); leaf-like; stalked

HALISERIS	IV
ALARIA	III

— without a Midrib.

Leathery; slimy.

Broad expansions; spreading from thick stalks; variously slit .

LAMINARIA	III
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Membranaceous.

Long; narrow (in proportion); ribbon-like; stalked
 " " " tubular, though compressed;
 " surface speckled with dots
 Leaf-like; tapering to the base; "
 Fan-shaped, or circular; margins *curled*; marked by concentric lines
 " margins *flat*; " but the lines obscure
 Spreading fan-wise; irregularly slit; tips bluntly cut; marked by both lines and dots
 Much and irregularly slit; tips torn, pointed; speckled with dots
 Narrow; forked throughout; root woolly
 Leaf-like stem and branches, tapering to each end; branches opposite
 Very narrow; irregularly forked; young shoots springing from blunt tips
 Extremely narrow stems and branches (thread-like); thorny; or fringed with bright green tufts

LAMINARIA	III
ASPEROCOCCUS	IV
PUNCTARIA	IV
PADINA	IV
ZONARIA	IV
TAONIA	IV
CUTLERIA	IV
DICTYOTA	IV
DESMARESTIA	II
CARPOMITRA	II
DESMARESTIA	II

CYLINDRICAL (*thread-shaped*).

— unjointed.

Tough; leathery.

Thick, long, slimy, unbranched; tapering to each end
 Shrub-like stems and branches; bearing narrow mid-ribbed leaves and berry-like air-vessels
 " " " flattened; narrow; at one level throughout; air-vessels pod-like
 " " " flattened; growing all ways; very bushy; air-vessels oval inflations
 Thick, sometimes flattened stems; forked; air-vessels large oval inflations

CHORDA	V
SARGASSUM	I
HALIDRYIS	I
CYTOSEIRA	I
FUCODIUM	I

Membranaceous or Gelatinous.

	<i>Genus.</i>	<i>Fam.</i>
Long, loose-feeling, slimy; branching irregular; very thick and clumsy, or very slender	MESOGLOIA	V
Bag-like, of every width from a hog's bristle to six inches; speckled with dots; tips blunt	ASPEROCOCCUS	IV
Stem undivided; branches simple; bearing green-crested seed-pods	SPOROCHNUS	II
Stem undivided, or slightly forked; branches long; simple; clothed with fine colourless fibres	CHORDARIA	V
Stem and branches tapering to each end; opposite; marked by rings (<i>whorls</i>) of dots	STRIARIA	IV
Irregularly divided or branched; speckled with fruit-warts	STILOPHORA	IV
Stems profusely and repeatedly rebranched; branches alternate	DICTYOSIPHON	IV
" " " branches opposite	DESMARESTIA	II
Very short tufts; threads unbranched; clothed with colourless fibres	WYATTIA	IV

— clothed with **Jointed Branchleteens.**

Soft; branches distant; mostly opposite; branchleteens bright green, hair-like; set in rings (<i>whorls</i>)	ARTHROCLADIA	II
Rigid; dull olive or brown; branchleteens short, curved; in rings (<i>whorls</i>)	CLADOSTEPHUS	VI

— contracted at intervals.

Stems unbranched; contractions inflated; of irregular lengths	CHORDA	V
Large, bag-like; contractions inflated; of irregular lengths; speckled with dots	ASPEROCOCCUS	IV

— jointed.

Branches delicately plumed like feathers; main stems opaque	CHETOPTERIS	VI
" " " jointed throughout	SPHACELARIA	VI
Undivided stems clothed with branchlets tipped by colourless fibres	MYRIOTRICHIA	VI
Slender, thread-like tufts; profusely and variously branched	ECTOCARPUS	VI
,, very short tufts; threads unbranched; parasitic	ELACHISTA	V

INCRUSTATIONS or PATCHES.

— dark brown.

Leathery, skin-like, closely adhering, often rough with fruit-warts	RALFSIA	V
Fleshy, convex, smooth	LEATHESIA	V
Minute, parasitic, forming thin stains or convex dots	MYRIONEMA	V

IRREGULAR or DEFINED LUMPS.

Fleshy, irregularly round, in potatoe-like clusters, or rarely minute; parasitic	LEATHESIA	V
Tough, leathery, fungus-like, sending up long, strap-like, slimy, fruit-receptacles	HIMANTHALIA	I

RED SEA-WEEDS. (*Rhodospirms.*)*FLAT.*

— with a Midrib.

Membranaceous.

	<i>Genus.</i>	<i>Fam.</i>
Thin, leaflike; midribs throwing out leaflets	DELESSERIA	XI
" " " blood-red; fruiting in winter	WORMSKIOLDIA	XVI

— without a Midrib.

Membranaceous; thin.

Small; oval; leaf-like; with oval leaflets springing from the margins	CHYLOCLADIA	XVIII
Fan-shaped (rarely narrow); veins rising from the base	NITOPHYLLUM	XI
" no veins; turning orange in fresh water	NITOPHYLLUM	XI
Wedge-shaped; of various widths; purplish	RHODYMENIA	XVI
Oblong; of various widths; margins often fringed with frondlets	HALYMENIA	XVIII
Narrowish; repeatedly forked throughout; margins sometimes fringed	RHODOPHYLLIS	XVI
" more or less forked; tips obtuse; fruit-like midrib-lines	STENOGRAMME	XVI
Narrow; purplish; cut out into branches; margins notched	ODONTHALIA	VII
" distantly forked; divisions wedge-shaped	GRACILARIA	XI
" rose-red; last branchlets set on one side only, like the teeth of a comb	PLOCANIUM	XVI
Very narrow; repeatedly forked and branched upwards	EUTHORA	XVI
" stems and branches tapering to each end	GRATELOUPIA	XVIII

Membranaceous; thick.

Oval; rising from a short stalk	SCHIZYMENIA	XVIII
Soft; roundish; margins throwing out fronds	KALLYMENIA	XVIII
Crisp; slit into broad, wedge-shaped divisions	CALLOPHYLLIS	XVIII
" of various widths; margins fringed with frondlets	CALLIBLEPHARIS	XI

Rather rigid.

Stalked; wrinkled; margins throwing out young fronds	PHYLLOPHORA	XVIII
" " several times forked; expanding fan-wise	RHODYMENIA	XVI
" roundish; horizontally laid; rooted by fibres from its under surface	PEYSSONELIA	XIV
Stalked; branches regularly and repeatedly plumed and replumed with short branchlets and branchleteens	PTILOTA	XIX

Gristly.

	<i>Genus.</i>	<i>Fam.</i>
Stalked ; spreading fan-wise above ; many times forked	CHONDRUS	XVIII
" narrow ; repeatedly forked ; tips blunt ; dark red	GYMNOGONGRUS	XVIII
" " channelled ; spreading upwards into wedge-shaped divisions ; purple	GIGARTINA	XVIII
Narrow stems and branches tapering to both ends, tips of branchleteens blunt	GELIDIUM	XII
Shrubby ; much branched ; upper branches set with short, sharp, horizontally set branchleteens	SPHÆROCOCCUS	XI

CYLINDRICAL (thread-shaped), BRANCHED.

— unjointed.

Gristly.

Dark ; solid ; repeatedly and regularly forked ; root a disc	POLYIDES	XIII
" " " last forkings long ; root fibrous	FURCELLARIA	XVIII
Irregularly forked, beset with clusters of small, oval, membranaceous leaflets	LOMENTARIA	VIII
Purplish ; wiry ; closely forked ; entangled	GYMNOGONGRUS	XVIII
" " " distantly and irregularly branched ; entangled	AHNFELDTIA	XVIII
Branches strongly curved, and pointed ; branchlets few	GIGARTINA	XVIII
Simple ; or sparingly forked ; branches simple ; short	CORDYLECLADIA	XVI
Irregularly, often slightly, branched ; branches tapering to each end	GRACILARIA	XI
Very bushy ; often but irregularly rebranched ; tips pointed	CYSTOCLONIUM	XVIII
The thickness of hogs' bristles throughout ; forked or three forked ; tips swollen	GELIDIUM	XII

Membranaceous and Gelatinous.

Pale pink ; repeatedly forked ; tips blunt ; occasionally midribbed	SCINAIA	XV
Dull purple ; solid within ; irregularly forked ; clumsy	NEMALEON	XV
" " " tubular ; stems undivided ; branches long, simple, tapering to each end	DUMONTIA	XVIII
Purple red ; solid within ; stems undivided ; branches long, simple, tapering to each end	HELMINTHOCLADIA	XV
Fleshy ; sometimes compressed ; branched and rebranched with short blunt branchlets	LAURENCIA	VIII
Slender ; generally, undivided stems, set with long branches, clothed with very short branchlets	CHONDRIA	VII

More or less soft and threadlike.

	<i>Genus.</i>	<i>Fam.</i>
Bushy; nearly opaque; marked by lines across . . .	RYTIPHLÆA	VII
„ „ not marked by lines across . . .	RHODOMELA	VII
Dull purple; entangled; tips strongly curled inwards . . .	BOSTRYCHIA	VII
Rose-red; set throughout with exactly opposite branchlets	BONNEMAISONIA	VIII
„ irregularly forked; tips forked and hooked in . . .	MICROCLADIA	XIX
„ gelatinous; tubular; stems thick in the middle, gradually tapering to both ends; repeatedly rebranched	CHYLOCLADIA	XVIII
„ gelatinous; loose-feeling; bushy; branchlets crowded; generally opposite; very slender . . .	GLOIOSIPHONIA	XVIII
„ gelatinous; loose-feeling; branches and branchlets alternate; having a beaded appearance; tips pointed	DUDRESNAIA	XIX
„ gelatinous; loose-feeling; branches chiefly opposite; branchlets with blunt tips	HELMINTHORA	XV
„ gelatinous; branches spreading all ways; branchlets slender; often swollen in the middle; sometimes beaded	NACCARIA	IX

— clothed with Jointed Branchleteens.

Stems robust, often hairy; branchleteens tufted; alternate	DASYA	VII
„ thickened by rings (<i>whorls</i>) of overlapping branchleteens	HALURUS	XIX
„ marked by lines across; branchleteens hair-like; fringing	SPYRIDIA	XVII
„ undivided; repeatedly branched; branchleteens opposite, or in rings (<i>whorls</i>)	WRANGELIA	IX
Gelatinous; parasitic; branchleteens very short; in close rings (<i>whorls</i>)	CROUANIA	XIX

— contracted at intervals.

Gelatinous.

Contractions surrounded (<i>whorled</i>) by branches and branchlets	LOMENTARIA	VIII
Irregularly branched; contractions short and uniform throughout	CHAMPIA	VIII
Dull purple; short; matted; contractions of different sizes	CATENELLA	XVIII
Thick; repeatedly forked; contracted at the angles of division	SCINAIA	XV
Contractions strongly marked; bead-like; forming oval leaflets; fresh sets springing from each contraction	CHYLOCLADIA	XVIII

— jointed.

Soft, and thread-like.

	<i>Genus.</i>	<i>Fam.</i>
Joints marked by several upright lines (internal colour-tubes)	POLYSIPHONIA	VII
Joints marked by one upright rose-coloured line (internal colour-tube); branching forked	GRIFFITHSIA	XIX
„ „ excessively slender; branchlets short, profuse, spreading	CALLITHAMNION	XIX
„ „ „ seeds (<i>spores</i>) in bead-like strings	SEIROSPORA	XIX
„ „ the thickness of horse-hair; stems distantly set with tufted branchlets	CORYNOSPORA	XIX
Joints wholly coloured; or partly coloured, partly transparent	CERAMIUM	XIX
Solid; opaque; coated with a limy deposit; stems branched and rebranched on each side	CORALLINA	X
„ „ coated with a limy deposit; branching forked throughout	JANIA	X

INCRUSTATIONS or PATCHES on Rocks and Algæ.

Glossy, dark red, adhering closely; when in fruit, pitted with small holes	HILDENBRANTIA	XIV
„ „ „ not pitted	CRUORIA	XIV
„ „ „ „	PETROCELIS	XIV
Minute; globose; drop-like; dark red	ACTINOCOCCUS	XIV
Lilac pink, fading to white; like white or tinted patches of lime	MELOBESIA	X
„ „ minute, dot-like (microscopic)	HAPALIDIUM	X

IRREGULAR LUMPS.

Solid; stony; coral-like, branched or unbranched	MELOBESIA	X
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GREEN SEA-WEEDS. (*Chlorosperms.*)

FLAT; MEMBRANACEOUS.

— ribless.

Purple.

	<i>Genus.</i>	<i>Fam.</i>
Round or ribbon-like; broad or narrow expansions	PORPHYRA	XXI

Grass green.

" " the membrane formed of <i>two</i> layers of cells	PHYCOSERIS	XXI
Puckered and bag-like when young, afterwards bursting; membrane formed of <i>one</i> layer of cells	ULVA	XXI
Narrow stems and branches; blunt at top; tapering greatly to the base	ENTEROMORPHA	XXI

CYLINDRICAL (*thread-shaped*).

— unjointed.

Solid.

Dark green; spongy; the thickness of a goose-quill; many times forked	CODIUM	XX
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Tubular; unbranched.

Bag-like; inflated; of every width from a hog's bristle to three inches	ENTEROMORPHA	XXI
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Tubular; thread-like; branched.

Threads in free tufts; or matted below; <i>zoospores</i> external	VAUCHERIA	XX
" long; undivided stems; profusely branched; tips pointed throughout	ENTEROMORPHA	XXI
Stems beautifully plumed like feathers; sometimes replumed	BRYOPSIS	XX
Rose-red; minute; parasitic; fringing; branching forked	BANGIA	XXI
Green " " " " " " " " " " " "	HORMOSPORA	XXV
" cushion-like tufts, formed of threads collected into branching bundles	SCHIZOTHRIX	XXIII

Tubular; filled with colour-cells; unbranched.

Long, dark-purple tufts; lying in glutinous layers on rocks	BANGIA	XXI
Rose-red; minute; parasitic; fringing	BANGIA	XXI
Green; " " in tufts, or forming close velvet-layers on rocks	CALOTHRIX	XXIII
Green; bright or dull; forming fleecy layers on floating plants	SPERMOSIRA	XXIV
" " threads simple; needle-like; massed into gelatinous layers	OSCILLATORIA	XXIII
" " threads simple; in bundles enclosed in snake-like sheaths	MICROCOLEUS	XXIII
Dull-green; threads in free tufts, or layers; matted below	LYNGBYA	XXIII

— contracted at intervals.

Compressed; distantly branched; tips blunt; contractions long

Genus.
ENTEROMORPHA *Fam.*
XXI

— jointed.

Slender; tufted; much and variously branched and re-branched

CLADOPHORA XXII

„ pale green; in fleeces on rocks; not branched, but throwing out occasional fibres

RHIZOCLONIUM XXII

Slender, bright-green tufts; gelatinous; unbranched

HORMOTRICHUM XXII

„ of various shades of green; in tufts; never gelatinous; unbranched

CONFERVA XXII

Rose-red; minute; parasitic; fringing; joints containing colour-cells

GONIOTRICHUM XXI

Pale-green; minute; parasitic on grasses, &c.; forming a convex hairy dot

OCHLOCHÆTE XXII

FILMS, or PATCHES.

Small, roundish, gelatinous, floating; composed of branched threads

MONORMIA XXIV

Vivid or deep green, spreading over decaying plants on mud, or floating

SPHÆROZYGA XXIV

Verdigris green, spreading over decaying plants or on sticks

SPIRULINA XXIII

A dark glazy crust upon rocks; formed of closely-packed radiating threads

SCHIZOSIPHON XXIII

Dark green; velvety; spreading irregularly upon rocks; sometimes throwing up minute, cylindrical frondlets

CODIUM XX

IRREGULAR or DEFINED LUMPS.

Dark green; spongy; hollow; more or less globular

CODIUM XX

Globular, or convex; spreading like little balls on rocks and plants

RIVULARIA XXIII



LIST OF FAMILIES, GENERA, AND SPECIES, IN THE THREE
COLOUR GROUPS, FOR ARRANGEMENT IN THE
HERBARIUM.

MELANOSPERMS—(*Olive Group*).

Colour. Varying from olive-green to dark brown.

Fruit. Single seeds properly called *spores*; sunk, or partially or wholly immersed in the frond; or external.

Family 1.—FUCACEÆ.—*Tough; leathery; turning black when dry.*
Spores sunk in the frond in special, swollen, slimy portions
(receptacles).

SARGASSUM; vulgare, bacciferum.

HALIDRYS; siliquosa.

CYTOSEIRA; ericoides, granulata, barbata, feniculacea, fibrosa.

FUCUS; vesiculosus, ceranoides, serratus.

FUCODIUM; * nodosum, canaliculatum, Mackaii, tuberculatum.

HIMANTHALIA; lorea.

* Formerly *Fucus nodosus* (Fig. 13), *F. canaliculatus* (Fig. 15), *F. Mackaii* (Fig. 14), and *Pycnophycus tuberculatus* (Fig. 9).

Family 2.—SPOROCHNACEÆ.—*Soft; membranaceous; slender; turning a verdigris green in the air.*
Spores on external hair-like jointed threads.

CARPOMITRA; Cabrerae.

SPOROCHNUS; pedunculatus.

DESMARESTIA; ligulata, aculeata, viridis.

ARTHROCLADIA; villosa.

Family 3.—LAMINARIACEÆ.—*Leathery, or membranaceous; flat, leaf-like, stalked.*
Spores forming cloudy patches on the surface.

ALARIA; esculenta.

LAMINARIA; digitata var. stenophylla, bulbosa, longicuris, saccharina,
Phyllitis, fascia.

Family 4.—DICTYOTACEÆ.—*Soft; membranaceous; flat, or thread-shaped.*
Spores forming spots or lines on the surface.

HALISERIS; polypodioides.
 PADINA; Pavonia.
 ZONARIA; collaris, parvula.
 CUTLERIA; multifida.
 TAONIA; atomaria.
 DICTYOTA; dichotoma.
 STILOPHORA; rhizodes, Lyngbyæi.
 DICTYOSIPHON; fœniculaceus.
 STRIARIA; attenuata.
 WYATTIA;* pusilla, Laminariæ.
 ASPEROCOCCUS; compressus, Turneri, echinatus.
 PUNCTARIA; latifolia, plantaginea, tenuissima.

* Formerly *Litosiphon pusillus* (Fig. 52), and *L. Laminariæ* (Fig. 53).

Family 5.—CHORDARIACEÆ.—*Gelatinous; of various habits. Thread-shaped;*
tuber-like, or incrustations.
Spores on threads concealed in the frond.

CHORDA; filum, lomentaria.
 CHORDARIA; flagelliformis; divaricata.
 MESOGLOIA; vermicularis, Griffithsiana, virescens.
 LEATHESIA; tuberiformis, Berkeleyi, crispa.*
 RALFSIA; verrucosa.
 MYRIONEMA; strangulans, Leclancherii, punctiforme, clavatum.
 ELACHISTA; fucicola, flaccida, curta, stellulata, scutulata, pulvinata, velutina,
 Grevillei,* Haydeni.*

* See Appendix of New Species.

Family 6.—ECTOCARPACEÆ.—*More or less soft and slender; thread-shaped;*
jointed.
Spores external on the branches.

CLADOSTEPHUS; verticillatus, spongiosus.
 CHÆTOPTERIS;* plumosa.
 SPHACELARIA; filicina, Sertularia, scoparia, cirrhosa, fusca, radicans, racemosa.
 ECTOCARPUS; siliculosus, amphibius, fenestratus, fasciculatus, Hincksia, tomentosus, crinitus, pusillus, distortus, Landsburgii, littoralis, longifructus, granulosus, sphærophorus, brachiatus, Mertensii.
 MYRIOTRICHIA; clavæformis, filiformis.

* Formerly *Sphacelaria plumosa* (Fig. 72).

RHODOSPERMS—(*Red Group*).

Colour. Varying from pink to crimson, or dark, reddish purple.

Fruit. Of two kinds—1. Simple seeds, properly called *Spores*. 2. Four-parted seeds, called *Tetraspores*; external; or sunk, or wholly or partially immersed in the frond.

Family 7.—RHODOMELACEÆ.—*Soft; slender; thread-like; or membranaceous; flat.*

1. Spores in external cases (capsules), having an opening at top.
2. Tetraspores immersed.

ODONTHALIA; dentata.

CHONDRIA; * dasyphylla, tenuissima.

RHODOMELA; lycopodioides, subfusca.

RYTIPHLEÆ; pinastroides, complanata, thuyoides, fruticulosa.

POLYSIPHONIA; urceolata, formosa, pulvinata, fibrata, spinulosa, Richardsoni, Griffithsiana, elongella, elongata, violacea, Carmichaeliana, fibrillosa, Brodiaei, variegata, obscura, simulans, nigrescens, affinis, subulifera, atro-rubescens, furcellata, fastigiata, parasitica, byssoides.

BOSTRYCHIA; scorpioides.

DASYA; coccinea, ocellata, arbuscula, venusta, Cattlovæ? †, punicea. ‡

* Formerly *Laurencia dasyphylla* (Fig. 144), and *L. tenuissima* (Fig. 143).

† See Appendix of New Species.

‡ See Appendix of New Species.

Family 8.—LAURENCIACEÆ.—*Soft and thread-like; fleshy or gelatinous.*

1. Spores in external closed cases (capsules).
2. Tetraspores immersed.

BONNEMAISONIA; asparagoides.

LAURENCIA; pinnatifida, cœspitosa, obtusa.

LOMENTARIA; * ovalis, kaliformis, reflexa.

CHAMPIA; † parvula.

* Formerly *Chylocladia ovalis* (Fig. 145); *C. kaliformis* (Figs. 146, 151), and *C. reflexa* (Fig. 138).

† Formerly *Chylocladia parvula* (Fig. 153).

Family 9.—WRANGELIACEÆ.—*Soft, thread-like; more or less visibly clothed with jointed branchleteens.*

1. Spores in masses, on external, hair-like, jointed threads.
2. Tetraspores external.

WRANGELIA; multifida.

NACCARIA; Wiggii, hypnoides.*

* See Appendix of New Species.

Family 10.—CORALLINACEÆ.—*Coral-like; lilac fading to white; thread-shaped; jointed; encrusting, or in lumps.*
One fruit. Tetraspores in external cases, having an opening at top.

CORALLINA; officinalis, elongata, squamata.

JANIA; rubens, corniculata.

MELOBESIA; polymorpha, calcarea, fasciculata, agariciformis, lichenoides, membranacea, farinosa, verrucata, pustulata.

HAPALIDIUM; Phyllactidium.

Family 11.—SPHÆROCOCOIDEÆ.—*Delicately membranaceous; rarely gristly; flat and leafy; shrubby or thread-shaped.*
 1. Spores in external cases, with or without an opening.
 2. Tetraspores variously dispersed.

DELESSERIA; sinuosa, alata, angustissima, Hypoglossum, ruscifolia.

NITOPHYLLUM; punctatum, Hilliæ, Bonnemaïsoni, Gmelini, laceratum, versicolor.

SPHÆROCOCCLUS; coronopifolius.

CALLIBLEPHARIS; * ciliata, jubata.

GRACILARIA; multipartita, compressa, confervoides.

* Formerly *Rhodymenia ciliata* (Fig. 187), and *R. jubata* (Fig. 188.)

Family 12.—GELIDIACEÆ.—*Gristly or horny; flat or, rarely, thread-shaped.*
 1. Spores in swollen branchlets.
 2. Tetraspores also immersed.

GELIDIUM; corneum, cartilagineum.

Family 13.—SPONGIOCARPEÆ.—*Gristly; cylindrical.*
 1. Spores hidden in pink wart-like excrescences.
 2. Tetraspores immersed.

POLYIDES; rotundus.

Family 14.—SQUAMARIEÆ.—*Leathery or membranaceous; gelatinous. Encrusting, or horizontally laid.*
One fruit. Tetraspores in wart-like excrescences; or immersed.

PEYSSONELIA; Dubyi.

HILDENBRANTIA; rubra.

CRUORIA; pellita,* adhærens.

PETROCELIS; † cruenta.

ACTINOCOCCUS; ‡ Henedyi.

* See Appendix of New Species.

+ Formerly *Cruoria pellita* (Fig. 227).

‡ See Appendix of New Species.

Family 15.—HELMINTHOCLADIEÆ.—*Gelatinous; cylindrical; branched.*
One fruit. Globular masses of spores immersed.

SCINAIA; * furcellata.
 NEMALEON; † multifidum.
 HELMINTHORA; divaricata.
 HELMINTHOCLADIA; ‡ purpurea.

* Formerly *Ginnania furcellata* (Fig. 226).
 † Formerly *Dudresnaia divaricata* (Fig. 221).
 ‡ Formerly *Nemalicon purpureum* (Fig. 217).

Family 16.—RHODYMENIACEÆ.—*Delicately membranaceous; flat; compressed, or thread-shaped.*

1. *Masses of spores in external cases (capsules), or half-immersed.*
2. *Tetraspores variously dispersed.*

WORMSKIOLDIA; * sanguinea.
 PLOCAMIUM; coccineum.
 STENOGRAMME; interrupta.
 RHODOPHYLLIS; † bifida.
 EUTHORA; ‡ cristata.
 RHODYMENIA; palmetta; palmata.
 CORDYLECLADIA; § erecta.

* Formerly *Delesseria sanguinea* (Fig. 169).
 † Formerly *Rhodymenia bifida* (Fig. 183).
 ‡ Formerly *Rhodymenia cristata* (Fig. 184).
 § Formerly *Gracilaria erecta* (Fig. 168).

Family 17.—SPYRIDIACEÆ.—*Soft; membranaceous; thread-like; fringed with jointed branchleteens.*

1. *Spores in external, closed cases (capsules).*
2. *Tetraspores, external.*

SPYRIDIA; filamentosa.

Family 18.—CRYPTONEMIACEÆ.—*Of every sort of substance and habit. The internal structure consisting wholly, or in part, of jointed threads, compacted together by gelatine. Or some of the membranaceous species made up of many-sided cells similarly compacted.*

1. *Masses of spores in external cases (capsules), with or without an opening.*
2. *Tetraspores chiefly immersed.*

PHYLLOPHORA; rubens, membranifolia, Brodiaei, palmettoides.
 GYMNONGRUS; Griffithsiae, Norvegicus.*
 AHNFELDTIA; † plicata.

* Formerly *Chondrus norvegicus* (Fig. 203).
 † Formerly *Gymnogongnus plicatus* (Fig. 211).

CYSTOCLONIUM ; * purpurascens.
 CALLOPHYLLIS ; † laciniata.
 KALLYMENIA ; reniformis.
 GIGARTINA ; pistillata, acicularis, Teedii, mamillosa.
 CHONDRUS ; crispus.
 HALYMENIA ; ligulata.
 CHYLOCLADIA ; ‡ clavellosa, rosea, articulata.
 DUMONTIA ; filiformis.
 CATENELLA ; opuntia.
 FURCELLARIA ; fastigiata.
 GRATELOUPIA ; filicina.
 SCHIZYMENIA ; § Dubyi, edulis.
 GLOIOSIPHONIA ; capillaris.

* Long known as *Hypnea purpurascens*.

† Formerly *Rhodymenia laciniata* (Fig. 179).

‡ Formerly *Chrysymenia clavellosa* (Fig. 136), and *C. rosea* (Figs. 141, 142).

§ Formerly *Kallymenia Dubyi* (Fig. 213), and *Iridaea edulis* (Fig. 214).

Family 19.—CERAMIACEÆ.—*Soft and thread-like; rarely rather rigid; jointed; transparent; or wholly or partly coated with colour-cells.*

1. *Masses of spores in external, closed cases (capsules), often in pairs; or rarely naked.*
2. *Tetraspores, external, superficial, or half-immersed.*

MICROCLADIA ; glandulosa.

CERAMIUM ; rubrum, botryocarpum, decurrens, Deslongchampsii, diaphanum, gracillimum, strictum, nodosum, fastigiatum, flabelligerum, echionotum, acanthonotum, ciliatum.

DUDRESNAIA ; coccinea.

CROUANIA ; attenuata.

PTILOTA ; plumosa, elegans.

HALURUS ; * equisetifolius, simplicifilum.

GRIFFITHSIA ; barbata, Devoniensis, corallina, secundiflora, setacea.

CORYNOSPORA ; † pedicellata.

SEIROSPORA ; ‡ Griffithsiana.

CALLITHAMNION ; plumula, cruciatum, floccosum, Turneri, barbatum, pluma, arbuscula, Brodiaei, tetragonum, brachiatum, tetricum, Hookeri, roseum, byssoideum, polyspermum, purpurascens, fasciculatum, Borreri, affine, tripinnatum, gracillimum, thuyoideum, corymbosum, spongiosum (or *granulatum*), Rothii, floridulum, mesocarpum, sparsum, Daviesii, virgatulum.

* Formerly *Griffithsia equisetifolia* (Fig. 244), and *G. simplicifilum* (Fig. 247).

† Formerly *Callithamnion pedicellatum* (Fig. 283).

‡ The bead-like fruit of this plant is incorrectly called *tetraspores* under Fig. 248. The true *tetraspores* are "scattered and pedunculate," as described by Areschoug, and such have been lately observed by Dr. Arnott on a specimen from Jersey.

CHLOROSPERMS.—(*Green Group.*)

Colour. Varying from bright grass-green to dark-green. In a few exceptional cases, purple and rose-red.

Fruit. Minute seeds called *Zoospores*, from having at one period a motion as of animal life; formed of the colouring matter (*endochrome*) in the cells or tubes of which the frond is composed; very rarely external.

Family 20.—*Spongy or soft and thread-like. Threads tubular, filled with liquid green colouring-matter (endochrome).*

Zoospores in external cases (capsules), or internal.

CODIUM; bursa, adhærens, amphibium, tomentosum.

VAUCHERIA; submarina, marina, velutina.

BRYOPSIS; plumosa, hypnoides.

Family 21.—**ULVACEÆ.**—*Soft; membranaceous; flat or thread-like; tubular. Composed of colour-cellules laid side by side; or containing colour-cells variously arranged.*

Zoospores internal.

PORPHYRA; laciniata, vulgaris.

BANGIA; fusco-purpurea, ciliaris, elegans.*

GONIOTRICHUM; † ceramicola.

ENTEROMORPHA; Cornucopiæ, intestinalis, compressa, Linkiana, erecta, clathrata, ramulosa, Hopkirkii, percursa, Ralfsii.

PHYCOSERIS; ‡ latissima, linza.

ULVA; lactuca.

* Of doubtful affinity. See under Fig. 350.

† Formerly *Bangia ceramicola* (Fig. 349); the change of name was accidentally omitted in its proper place.

‡ Formerly *Ulva latissima* (Fig. 342), and *U. linza* (Fig. 344). This subdivision of the *Ulvas* is scarcely established. The collector can adopt it or let it one, as he pleases.

Family 22.—**CONFERVACEÆ.**—*Soft tufts of jointed threads. Joints containing liquid colouring matter (endochrome).*

Zoospores internal.

OCHLOCHÆTE; hystrix.

CLADOPHORA; Brownii, repens, pellucida, rectangularis, Macallana, Hutchinsii, diffusa, nuda, rupestris, lætevirens, flexuosa, gracilis, Balliana, Rudolphiana, refracta, albida, lanosa, uncialis, arcta, glaucescens, falcata, Magdalenæ, Gattyæ, flavescens, fracta.

RHIZOCLONIUM; riparium, Casparyi.

*HORMOTRICHUM; collabens, bangioides, Younganum, Carmichaelii, speciosum, flaccum, Cutleria.

CONFERVA; arenicola, arenosa, littorea, Linum, sutoria, tortuosa, implexa, Melanogonium, aerea, clandestina.

* Formerly *C. collabens* (Fig. 327), *Conferva bangioides* (Fig. 328), *C. Youngana* (Fig. 337), *Lyngbya Carmichaelii* (Fig. 368), *L. speciosa* (Fig. 369), *L. Cutleriae* (Fig. 370,) and *L. flacca* (Fig. 359).

Family 23.—OSCILLARIACEÆ.—*Solid masses or soft tufts of tubular threads, each thread containing a row of narrow cylindrical colour-cells.*

Zoospores internal.

RIVULARIA; plicata, atra, nitida.

CALOTHRIX; confervicola, luteola, scopulorum, fasciculata, pannosa, semiplena, hydroides, caespitula.

SCHIZOTHRIX; Creswellii.

SCHIZOSIPHON; Warrenia.

LYNGBYA; majuscula, ferruginea.

OSCILLATORIA; littoralis, spiralis, nigro-viridis, subuliformis, insignis.

MICROCOLEUS; anguiformis.

SPIRULINA; tenuissima.

Family 24.—NOSTOCHINEÆ.—*Soft tubular threads lying in gelatine, forming filmy patches; each thread containing a row of colour-cells, interrupted here and there by one of different character (heterocyst).*

Zoospores internal.

SPERMOSIRA; littorea, Harveyana.

SPHÆROZYGA; Carmichaeli, Thwaitesii, Broomei, Berkeleyana.

MONORMIA; intricata.

Family 25.—PALMELLACEÆ.—*Soft, gelatinous, tubular threads, each containing a row of colour-cells.*

Zoospores internal; the colouring-matter (endochrome) dividing into rays.

HORMOSPORA; ramosa.

ALPHABETICAL TABLE OF GENERA AND SPECIES.

Actinococcus.	Fig.	C. Borreri	Fig.	C. pannosa	Fig.
Hennedyi, <i>page</i> 166.		brachiatum	272	scopulorum	357
Ahnfeldtia.		Brodiaei	258	sempilena	363
plicata	211	byssodeum	269	Carpomitra.	
Alaria.		corymbosum	276	Cabreræ	22
esculenta	23	cruciatum	250	Catenella.	
Arthrocladia.		Daviesii	281	Opuntia	204
villosa	20	fasciculatum	271	Ceramium.	
Asperococcus.		floccosum	263	acanthotum	240
compressus	44	floridulum	277	botryocarpum	243
echinatus	46	gracillimum	274	ciliatum	241
Turneri	45	Hookeri	268	decurrans	231
Bangia.		mesocarpum	279	Deslongchampsii	236
<i>ceramicola</i> *	349	<i>pedicellatum</i>	283	diaphanum	237
ciliaris	348	Pluma	267	echionotum	239
elegans	350	Plumula	254	fastigiatum	235
fusco-purpurea	347	polyspermum	270	flabelligerum	238
Bonnemaisonia.		roseum	260	gracillimum	232
asparagoides	133	Rothii	278	nodosum	234
Bostrychia.		sparsum	280	rubrum	242
scorpioides	139	spongiosum	265	strictum	233
Bryopsis.		tetragonum	264	Champia.	
hypnoides	287	tetricum	259	parvula	153
plumosa	286	thuyoideum	275	Chætopteris.	
Calliblepharis.		tripinnatum	261	plumosa	72
ciliata	187	Turneri	266	Chondria.	
jubata	188	virgatulum	282	dasyphylla	144
Callithamnion.		Callophyllis.		tenuissima	143
affine	273	laciniata	179	Chondrus.	
arbuscula	262	Calothrix.		crispus	202
barbatum	256	cæspitula	366	<i>Norvegicus</i>	203
		confervicola	356		
		fasciculata	362		
		hydroides	365		
		luteola	361		

* Italics indicate plants with changed names.

Chorda.	Fig.	Codium.	Fig.	Delesseria.	Fig.
filum	31	adharens	288	alata	171
lomentaria	32	amphibium	289	angustissima	150
Chordaria.		Bursa	284	Hypoglossum	172
divaricata	48	tomentosum	285	ruscifolia	182
flagelliformis	47	Conferva.		<i>sanguinea</i>	169
Chrysomenia.		ærea	326 b	sinuosa	170
<i>clavellosa</i>	136	arenicola	317	Desmarestia.	
<i>rosea</i>	141	arenosa	321	aculeata	18
<i>rosea</i> , var.	142	<i>bangioides</i>	328	Dresnæi, page 161.	
Chylocladia.		<i>collabens</i>	327	ligulata	17
articulata	147	implexa	320	viridis	19
clavellosa	136	Linum	323	Dictyosiphon.	
<i>kaliformis</i>	146	littorea	322	feniculaceus	40
<i>ovalis</i>	145	Melagonium	326 a	Dictyota.	
<i>parvula</i>	153	sutoria	336	dichotoma	37
<i>reflexa</i>	138	tortuosa	319	Dudresnaia.	
<i>rosea</i>	141	<i>Youngana</i>	337	coccinea	220
<i>rosea</i> , var.	142	Corallina.		<i>divaricata</i>	221
Cladophora.		officinalis	148	Dumontia.	
albida	324	squamata	149	filiformis	209
arcta	310	Cordylecladia.		Ectocarpus.	
Balliana	303	erecta	168	amphibius	85
Brownii	293	Corynospora.		brachiatus	90
diffusa	298	pedicellata	283	crinitus	91
falcata	325	Crouania.		distortus	87
flavescens	314	attenuata	229	fasciculatus	82
flexuosa	301	Cruoria.		fenestratus	86
fracta	315	<i>pellita</i>	227	granulosus	95
Gattyæ	313	<i>pellita</i> , page 165.		Hincksæ	83
glaucescens	311	<i>adhærens</i> , page 166.		Landsburgii	88
gracilis	302	Cutleria.		littoralis	93
Hutchinsiae	297	multifida	33	longifructus	94
lætevirens	300	Cystoclonium.		Mertensii	96
lanosa	308	purpurascens	195	pusillus	92
Macallanæ	296	Cystoseira.		siliculosus	81
Magdalænæ	312	barbata	6	sphærophorus	89
nuda	307	ericoides	4	tesselatus, page 163	
pellucida	294	fibrosa	8	tomentosus	84
rectangularis	295	fœniculacea	7	Elachista.	
refracta	305	granulata	5	curta	63
repens	306	Dasya.		flaccida	62
Rudolphiana	304	Arbuscula	152	fucicola	61
rupestris	299	Cattlovivæ (?), page 164.		Grevillei, page 162.	
uncialis	309	coccinea	135	Haydeni, page 162.	
Cladostephus.		ocellata	137	pulvinata	66
spongiosus	73	punica, page 164		scutulata	65
verticillatus	58	venusta	107	stellulata	64
				velutina	67

Enteromorpha.	Fig.	Grateloupia.	Fig.	Iridæa.	Fig.
clathrata	333	flicina	186	<i>edulis</i>	214
compressa	330	Griffithsia.		Jania.	
Cornucopiæ	339	barbata	250	corniculata	155
erecta	332	corallina	252	rubens	154
intestinalis	329	Devoniensis	251	Kallymenia.	
Hopkirkii	335	<i>equisetifolia</i>	245	<i>Dubyi</i>	213
Linkiana	331	secundiflora	246	reniformis	215
percursa	340	setacea	253	Laminaria.	
Ralfsii	341	<i>simplicifilum</i>	247	bulbosa	26
ramulosa	334	Gymnogongrus.		digitata	24
Euthora.		Griffithsiæ	200	digitata, var.	25
cristata	184	<i>plicatus</i>	211	Fascia	30
Fucodium.		Norvegicus	203	longicurris	27
tuberculatum	9	Halidrys.		Phyllitis	29
nodosum	13	siliquosa	3	sacharina	28
Mackaii	14	Haliseris.		Laurencia.	
canaliculatum	15	polypodioides	34	cæspitosa	140
Fucus.		Halurus.		<i>dasyphylla</i>	144
<i>canaliculatus</i>	15	equisetifolius	245	obtusa	132
ceranoides	11	<i>simplicifilum</i>	247	pinnatifida	131
<i>Mackaii</i>	14	Halymenia.		<i>tenuissima</i>	143
<i>nodosus</i>	13	ligulata	216	Leathesia.	
serratus	12	Hapalidium.		Berkeleyi	59
vesiculosus	10	Phyllactidium	162	tuberiformis	54
Furcellaria.		Helminthocladia.		<i>crispa</i> , page 161.	
fastigiata	208	purpurea	217	Litosiphon.	
Gelidium.		Helminthora.		<i>Laminariae</i>	53
cartilagineum	192	divaricata	221	<i>pusillus</i>	52
corneum	199	Hildenbrandtia.		Lomentaria.	
Gigartina.		rubra	161	ovalis	145
acicularis	225	Himanthalia.		kaliformis	146
mamillosa	194	loreæ	16	reflexa	138
pistillata	197	Hormospora.		Lyngbya.	
Teedii	201	ramosa	360	<i>Carmichaelii</i>	368
Ginannia.		Hormotrichum.		<i>Cutleriae</i>	370
<i>furcellata</i>	226	collabens	327	ferruginea	367
Gloiosiphonia.		bangioides	328	<i>flacca</i>	359
capillaris	219	Younganum	337	majuscula	358
Goniotrichum.		Carmichaelii	368	<i>speciosa</i>	369
ceramicola	349	speciosum	369	Melobesia.	
Gracilaria.		flaccum	359	agariciformis	159
compressa	193	Cutleriae	370	calcarea	156
confervoides	198			farinosa	164
<i>erecta</i>	168			fasciculata	158
multipartita	196			lichenoides	160

<i>M. membranacea</i>	Fig. 163	Padina.	Fig.	<i>P. plumosa</i>	Fig. 223
<i>polymorpha</i>	157	<i>Pavonia</i>	35	<i>sericea</i>	222
<i>pustulata</i>	166	Petrocelis.		Punctaria.	
<i>verrucata</i>	165	<i>cruenta</i> , page 165	227	<i>latifolia</i>	42
Mesogloia.		Peyssonelia.		<i>plantaginea</i>	43
<i>Griffithsiana</i>	56	<i>Dubyi</i>	224	<i>tenuissima</i>	51
<i>vermicularis</i>	55	Phyllophora.		Pycnophycus.	
<i>virescens</i>	57	<i>Brodiaei</i>	207	<i>tuberculatus</i>	9
Microcladia.		<i>membranifolia</i>	206	Ralfsia.	
<i>glandulosa</i>	230	<i>palmettoides</i>	228	<i>verrucosa</i>	60
Microcoleus.		<i>rubens</i>	205	Rhizoclonium.	
<i>anguiformis</i>	371	Plocanium.		<i>Casparyi</i>	318
Monormia.		<i>coccineum</i>	178	<i>riparium</i>	316
<i>intricata</i>	378	Polyides.		Rhodomela.	
Myrionema.		<i>rotundus</i>	212	<i>lycopodioides</i>	100
<i>clavatum</i>	75	Polysiphonia.		<i>subfusca</i>	103
<i>Leclancherii</i>	69	<i>affinis</i>	122	Rhodophyllis.	
<i>punctiforme</i>	70	<i>atro-rubescens</i>	130	<i>bifida</i>	183
<i>strangulans</i>	68	<i>Brodiaei</i>	120	Rhodymenia.	
Myriotrichia.		<i>byssoides</i>	134	<i>bifida</i>	183
<i>clavæformis</i>	97	<i>Carmichaeliana</i>	118	<i>ciliata</i>	187
<i>filiformis</i>	98	<i>elongata</i>	105	<i>cristata</i>	184
Naccaria.		<i>elongata, var.</i>	106	<i>jubata</i>	188
<i>Wiggii</i>	218	<i>elongella</i>	117	<i>laciniata</i>	179
<i>hypnoides</i> , page 164.		<i>fastigiata</i>	127	<i>palmata</i>	189
Nemalion.		<i>fibrata</i>	113	<i>palmata, var.</i>	190
<i>multifidum</i>	210	<i>fibrillosa</i>	123	<i>Palmetta</i>	180
<i>purpureum</i>	217	<i>foetidissima</i> , page 164.		Rivularia.	
Nitophyllum.		<i>formosa</i>	110	<i>atra</i>	352
<i>Bonnemaïsoni</i>	185	<i>furcellata</i>	126	<i>nitida</i>	353
<i>Gmelini</i>	176	<i>Griffithsiana</i>	116	<i>plicata</i>	351
<i>Hilliæ</i>	175	<i>nigrescens</i>	121	Rytiplhæa.	
<i>laceratum</i>	177	<i>obscura</i>	111	<i>complanata</i>	108
<i>punctatum</i>	173	<i>parasitica</i>	128	<i>fruticulosa</i>	102
<i>punctatum, var.</i>	174	<i>pulvinata</i>	112	<i>oxyacantha</i> , page 163.	
<i>versicolor</i>	181	<i>Richardsoni</i>	115	<i>pinastroides</i>	104
Ochlochæte.		<i>simulans</i>	125	<i>thuyoides</i>	101
<i>Hystrix</i>	338	<i>spinulosa</i>	114	Sargassum.	
Odonthalia.		<i>subulifera</i>	129	<i>bacciferum</i>	2
<i>dentata</i>	99	<i>urceolata</i>	109	<i>vulgare</i>	1
Oscillatoria.		<i>variegata</i>	124	Schizymenia.	
<i>insignis</i>	377	<i>violacea</i>	119	<i>Dubyi</i>	213
<i>littoralis</i>	372	Porphyra.		<i>edulis</i>	214
<i>nigro-viridis</i>	375	<i>laciniata</i>	345	Schizosiphon.	
<i>spiralis</i>	373	<i>vulgaris</i>	346	<i>Warreniæ</i>	354
<i>subuliformis</i>	376	Ptilota.			
		<i>elegans</i>	222		

	Fig.		Fig.		Fig.
Schizothrix.		Sphærozyga.		Taonia.	
<i>Creswellii</i>	355	<i>Berkeleyana</i>	383	<i>atomaria</i>	36
Scinaia.		<i>Broomei</i>	382	Ulva.	
<i>furcellata</i>	226	<i>Carmichaelii</i>	379	<i>Lactuca</i>	343
Seirospora.		<i>Thwaitesii</i>	380	<i>latissima</i>	342
<i>Griffithsiana</i>	249	Spirulina.		<i>Linza</i>	344
Spermosira.		<i>tenuissima</i>	374	Vaucheria.	
<i>Harveyana</i>	384	Sporochnus.		<i>marina</i>	290
<i>littorea</i>	381	<i>pedunculatus</i>	21	<i>submarina</i>	291
Sphacelaria.		Spyridia.		<i>velutina</i>	292
<i>cirrhusa</i>	77	<i>filamentosa</i>	244	Wormskioldia.	
<i>filicina</i>	74	Striaria.		<i>sanguinea</i>	169
<i>fusca</i>	78	<i>attenuata</i>	41	Wrangelia.	
<i>plumosa</i>	72	Stenogramme.		<i>multifida</i>	248
<i>racemosa</i>	80	<i>interrupta</i>	167	Wyattia.	
<i>radicans</i>	79	Stilophora.		<i>Laminariæ</i>	53
<i>scoparia</i>	71	<i>Lyngbyæi</i>	39	<i>pusilla</i>	52
<i>Sertularia</i>	76	<i>rhizodes</i>	38	Zonaria.	
Sphærococcus.				<i>collaris</i>	49
<i>coronopifolius</i>	191			<i>parvula</i>	50

PLATE I.

Fig. 1. SARGASSUM VULGARE.

Colour. When fresh, olive ; when dry, reddish brown.

Substance. Tough, leathery.

Character of Frond. Stem and branches. Branches on each side the stem (*pinnate*) ; alternate ; bearing distinct leaves. Leaves midribbed ; oblong ; toothed like a saw (*serrated*) at the edges ; generally marked with minute dark dots (*pores*).

Measurement. From 12 to 18 inches long. Width of leaves, variable.

Air-vessels. Like tiny round balls, borne on flat stalks, springing from the angles of the branches (*axillary*).

Fructification. Minute seeds (properly called *spores*) in special receptacles ; several on a branchlet just above the air-vessel.

Habitat. Atlantic Ocean. Tropical and sub-tropical coasts. Florida, Syria, &c. Drifted to our shores by oceanic currents ; but very rarely.

Fig. 2. SARGASSUM BACCIFERUM.

Colour. When young, pale olive ; clear ; in age, foxy ; when dry, black.

Substance. Tough, leathery ; when dry, brittle.

Character of Frond. Stems and branches. Stems angularly bent. Branching irregular ; sometimes from a central point in all directions. Branches bearing distinct leaves. Leaves midribbed, extremely narrow (*linear-lanceolate*) toothed like a saw (*serrated*) at the edges ; without dots (*pores*).

Measurement. Indefinite ; as it is found in masses, without a root.

Air-vessels. Like tiny round balls, smaller than in *S. vulgare* ; generally tipped with a spine-like point, sometimes short, sometimes long ; occasionally, without.

Fructification. Very rarely found. Like that of *S. vulgare*.

Habitat. Tropical and sub-tropical ocean, in both hemispheres ; always floating.

This is the celebrated Gulf-weed which stayed the ships of Columbus. No root has ever been found on it. Its growth is by young branches sprouting from old broken ones. Forming ridges (or banks, as they are called) in the sea, from 10 to 20 yards wide, and of indefinite length.

Fig. 3. HALIDRYS SILIQUOSA.

Colour. When young, greenish olive ; in age, glossy brown ; when dry, black.

Substance. Tough, leathery.

Character of Frond. Stem and branches. Everywhere compressed ; long and narrow with parallel sides (*linear*). Branching alternate ; repeated. The whole plant at one level, as if cut out of paper.

Measurement. From 1 to 4 feet long ; about $\frac{1}{2}$ of an inch wide.

Air-vessels. Long ; pod-like ; tipped with a point ; marked by obscure lines across ; internally, divided into compartments.

Fructification. Minute seeds (*spores*) in special receptacles, at the ends of the branches, thickening them.

Habitat. All round the coast. On rocks and in pools, at and below half-tide level ; common.

Fig. 4. CYSTOSEIRA ERICOIDES.

Colour. When fresh, clear olive ; giving out brilliant iridescent tints (blue and green) in the water. When dry, black.

Substance. Tough, leathery.

Character of Frond. Shrub-like. Stem cylindrical ; thick ; short ; woody ; beset with slender branches. Branches irregularly divided ; closely set with short, thorn-like branchlets, incurved like a shoemaker's awl (awl-shaped). Altogether very bushy. Root, a large hard disk.

Measurement. From 1 to 2 feet long.

Air-vessels. Inflations in the branches. Very small, solitary, just below the receptacles.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches, thickening them. Receptacles, cylindrical ; lumpy with tubercles ; beset with thorns.

Habitat. South of England. West and South of Ireland. On rocks near low-water mark and in tide-pools.

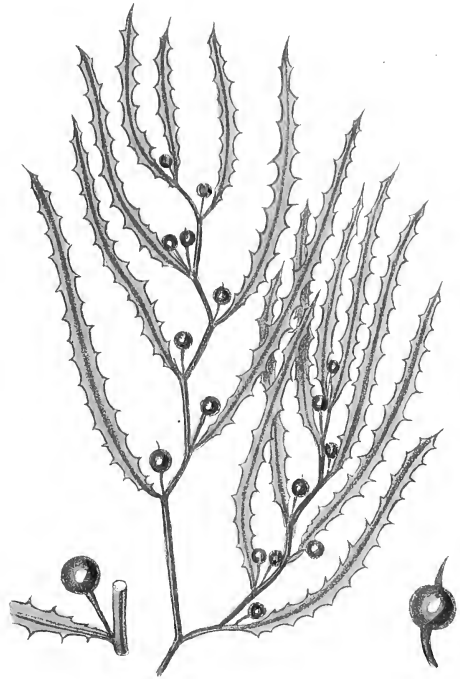
Often infested by a very minute, tufted, parasitic alga, *Elachista pulvinata* ; for which see Plate XVI, Fig. 66.

1.



Sargassum vulgare, Ag.

2.



Sargassum bacciferum, Ag.

3.



Halidrys siliquosa, Lyngb.

4.



Cystoseira ericcoides, Ag.



PLATE II.

Fig. 5. CYSTOSEIRA GRANULATA.

Colour. When fresh, semi-transparent olive ; when dry, black ; except the younger shoots.

Substance. Tough, leathery ; the young shoots more delicate.

Character of Frond. Shrub-like. Stem cylindrical ; thick ; short ; covered with bulbous knobs, from each of which springs a branch. Branches slender, repeatedly divided and branched ; irregularly set with thorn-like, incurved branchlets, having a tendency to a knob-like origin.

Measurement. Stem, 7 to 8 inches ; branches, 1 foot or more, long.

Air-vessels. Inflations in the upper part of the branches ; two or three together ; small ; oblong.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches, thickening them. Receptacles long and strongly tubercled ; an occasional spine.

Habitat. South of England. Ireland generally. Rocky tide-pools.

Fig. 6. CYSTOSEIRA FIBROSA.

Colour. When fresh, yellowish olive ; when dry, perfectly black.

Substance. Tough, leathery ; when dry, brittle.

Character of Frond. Shrub-like. Stem, compressed ; woody ; very much branched. Branches very slender ; the upper ones clothed with delicate thorn-like branchlets.

Measurement. 3 feet or more, long.

Air-vessels. Inflations in the branches towards the middle or lower part ; oval, large, sometimes thorny ; one, two, or three near each other ; often very abundant on the plant.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches, thickening them. Receptacles very long ; clothed with delicate thorn-like branchlets.

Habitat. England, west and south. Ireland, frequent. Rocks near low-water mark ; tide-pools ; deep water.

Infested by a minute, tufted, parasitic alga, *Elachista flaccida* ; for which see Plate XV.
Fig. 62. The very large air-vessels distinguish this *Cystoseira* from every other.

Fig. 7. CYSTOSEIRA FÆNICULACEA.

Colour. When fresh, clear, pale olive-green ; when dry, black.

Substance. Tough, leathery.

Character of Frond. Shrub-like. Stem a little compressed. Branches beset with rough points as if branchlets had been broken off. When young and growing in deep water, furnished with long, flat, cut-out, midribbed leaves, which afterwards become branches.

Measurement. From 1 to 2 feet long ; of which the stem is from 4 to 6 inches.

Air-vessels. Inflations in the branches near the ends ; small ; narrow ; oblong ; one or two together.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches, thickening them. Receptacles minute ; very long.

Habitat. South and South-west of England. Jersey. Rocks in tide-pools.

Fig. 8. CYSTOSEIRA BARBATA.

Colour. When fresh, reddish-brown ; when dry, perfectly black.

Substance. Tough, leathery.

Character of Frond. Shrub-like. Stem covered with bulbous knobs, from each of which springs a branch. Branches slender, cylindrical ; many times divided and branched.

Measurement. From 12 to 14 inches long.

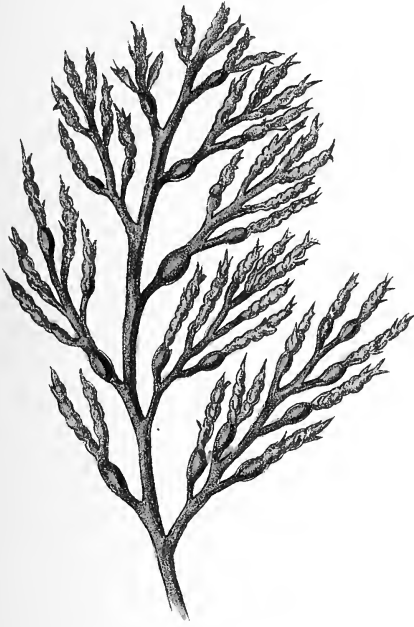
Air-vessels. Inflations in the upper part of the branches ; one or two near together ; chain-like.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches, thickening them ; tipped with a spine-like point.

Habitat. The Mediterranean. Said to have found its way to our shores formerly ; but has not been found for half a century or more.

The spine-like point of the receptacle distinguishes *C. barbata* from *C. granulata*, with which its knob-like processes might otherwise confound it.

5



Cystoseira granulata, Ag.

6.



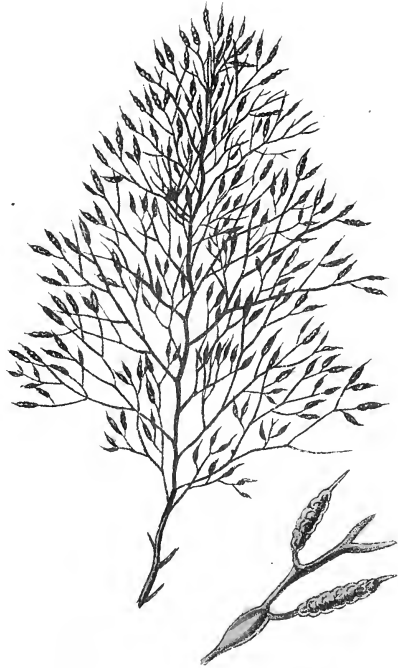
Cystoseira fibrosa, Ag.

7.



Cystoseira fœniculacea, Ag.

8.



Cystoseira barbata, Ag.

PLATE III.

Fig. 9. PYCNOPHYCUS TUBERCULATUS.

Colour. When growing, a fine olive ; when dry, black.

Substance. Tough, leathery. Brittle when dry.

Character of Frond. Cylindrical ; about as thick as a goosequill ; branched. Branching, repeatedly forked (*dichotomous*). Root fibrous.

Measurement. From 12 to 20 inches long.

Air-vessels. Inflations in the branches ; but often wanting.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches, thickening them. Receptacles long ; obtuse at the tips ; tubercled ; yellowish.

Habitat. Cornwall and Devonshire. West of Ireland. Jersey. In rock-pools near low-water mark.

By a change of classification and name, this plant is now *Fucodium tuberculatum*. The Family *Fucodium* comprehending also those members of the old Family *Fucus*, which are destitute of a midrib ; viz. *F. nodosus*, *F. Mackaii*, and *F. canaliculatus*.

Fig. 10. FUCUS VESICULOSUS.

Colour. When fresh, olive-brown ; when dry, black.

Substance. Tough, leathery ; slimy feeling.

Character of Frond. Flat, midribbed, branched, occasionally twisted ; branching, forked (*dichotomous*) ; margins smooth (*entire*).

Measurement. Sometimes extending to several feet in length. Dwarf varieties from 1 to 2 inches.

Air-vessels. Inflations in the branches ; round ; largish ; mostly in pairs ; often one on each side the midrib. But air-vessels are not unfrequently wanting.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches. Receptacles more or less oval ; large ; orange-coloured ; slimy ; tubercled.

Habitat. All round our coasts ; abundant. On all rocks, stones, piers, quays, &c. which become exposed at low water. Up rivers too, in similar situations, as long as the water is brackish ; but under such circumstances dwarfed and destitute of air-vessels.

A most widely distributed species. Found on the North Atlantic coasts, and extends even to the Tropics, Arctic Ocean, and Pacific coasts of N. America, Kamschatka, &c.

Fig. 11. FUCUS CERANOIDES.

Colour. A fine olive ; clear. Becoming darker, but not black, when dry.

Substance. Much less leathery and tough than its relatives (*congeners*). Described as *coriaceo-membranaceous* ; i. e. leathery thin-skin, or thin-skinned leather !

Character of Frond. Flat, with clearly marked line of midrib ; branched. Branching partially forked (*sub-dichotomous*). Side branches alternate, then diverging into several forkings. Width very variable. Margins smooth (*entire*).

Measurement. From 1 to 2 feet long.

Air-vessels. None : though a tendency to inflation in the axils of the upper forkings is often perceptible.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches. Receptacles oval ; a couple often forming the last forking ; smaller than those of *F. vesiculosus* ; orange-coloured, slimy, tubercled, but not so coarsely as those of *F. v.*

Habitat. Our shores generally ; but not so common as the rest of the family. On rocks and stones between tide-marks ; chiefly in places where rivers or other fresh waters run into the sea. Occasionally even in brackish water.

A very beautiful variety among the coarse Melanosperms, and an interesting plant to look for, from its not being so common as its brethren, and its greater refinement of appearance. It has been found thrown ashore at Filey.

Fig. 12. FUCUS SERRATUS.

Colour. A fine dark olive-green ; glossy ; retaining both its clearness and colour when dry.

Substance. Tough, leathery.

Character of Frond. Flat, midribbed, branched. Branching repeatedly forked (*dichotomous*). Width very variable. Margins always toothed like a saw (*serrated*), but more or less deeply so in different specimens.

Measurement. From 2 to 6 feet long ; width very various.

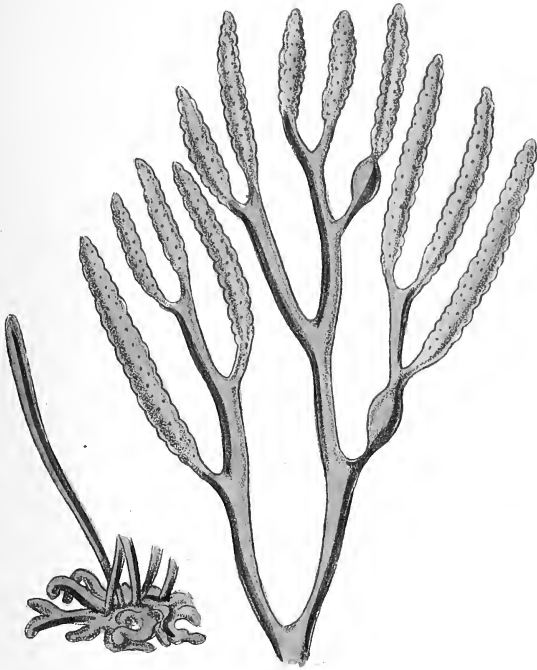
Air-vessels. None.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches. Receptacles narrow-oval ; flattish ; not extending to the margins, which retain the notched (*serrated*) character of the rest of the frond.

Habitat. Our rocky shores generally. At half-tide level ; very common.

The notched margins of this plant make it very easy of detection.

9



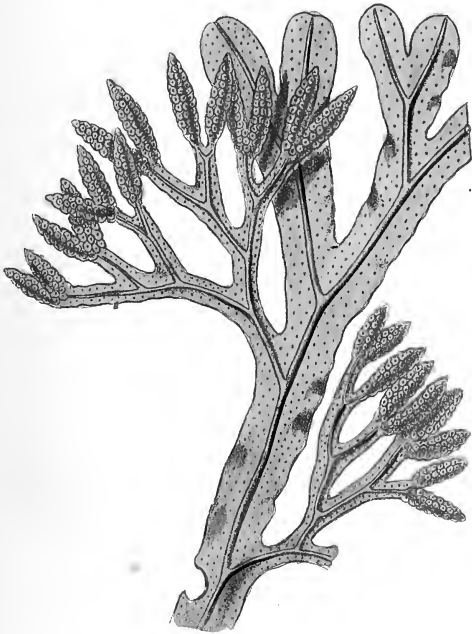
Pycnophycus tuberculatus, Kütz.

10



Fucus vesiculosus, Linn.

11



Fucus ceranoides, Linn.

12



Fucus serratus, Linn.



PLATE IV.

Fig. 13. FUCUS NODOSUS.

Colour. When fresh, olive-green ; glossy ; yellower in youth ; when dry, black.

Substance. Densely tough and leathery.

Character of Frond. Compressed narrow straps, several springing from a root ; thick ; branched. Branching partly forked (*dichotomous*), partly on each side of a stem, like a feather (*pinnate*). Margins toothed (*serrated*) at remote intervals.

Measurement. From 2 to 6 feet long.

Air-vessels. Inflations in the branches, swelling them out far beyond the margins ; very large, oblong.

Fructification. Minute seeds (*spores*) in special receptacles at the sides of the branches. Receptacles, globose ; on stalks ; growing from the axils of the marginal teeth ; slimy ; bright yellow.

Habitat. All round the coast ; very common ; between high-water mark and half-tide level.

Now *Fucodium nodosum*.

Fig. 14. FUCUS MACKAILI.

Colour. When fresh, dull olive-green ; when dry, black.

Substance. Tough, leathery ; when dry, rather horny.

Character of Frond. Cylindrical except at the base ; slender ; branched. Branching forked (*dichotomous*). Branches crowded, spreading.

Measurement. From 6 to 10 inches long.

Air-vessels. Inflations in the branches ; here and there one, alone ; longish oval ; wider than the branch.

Fructification. Minute seeds (*spores*) in special receptacles at the sides of the branches towards the base. Receptacles on long drooping stalks ; more or less ovate ; sometimes one, sometimes two from a stalk ; the two forming a fork.

Habitat. West of Ireland. On muddy sea-shores. Not rooted, but resting on mud or in gravel among large stones.

Now *Fucodium Mackailii*.

Fig. 15. FUCUS CANALICULATUS.

Colour. When fresh, olive-brown, or clear olive-yellow.

Substance. Tough, leathery; but not coarse.

Character of Frond. A tuft of narrow fronds from a root; branched. Branching repeatedly forked (*dichotomous*). Every part of the frond channelled or grooved on one side.

Measurement. From 2 to 6 inches long; from $\frac{1}{8}$ to $\frac{1}{6}$ of an inch wide.

Air-vessels. None.

Fructification. Minute seeds (*spores*) in special receptacles at the ends of the branches. Receptacles oblong; two from each tip forming a fork; lighter-coloured than the frond; slimy.

Habitat. Our rocky shores generally. Between high-water mark and half-tide level.

Now *Fucodium canaliculatum*. A pretty plant, and clearly marked by the groove or channel in its very narrow fronds, and by its growth in bushy tufts.

Fig. 16. HIMANTHALIA LOREA.

Colour. When fresh, olive; when dry, black.

Substance. Tough, leathery.

Character of Frond. Like a tiny leather peg-top standing upright. By degrees the top sinks in, and becomes cup-shaped. In the second year of growth, but not till then, it throws out long, strap-shaped receptacles from its centre.

Measurement. *Frond* about an inch high; *receptacles* from 2 to even 20 feet long; from $\frac{1}{6}$ to $\frac{1}{4}$ of an inch wide.

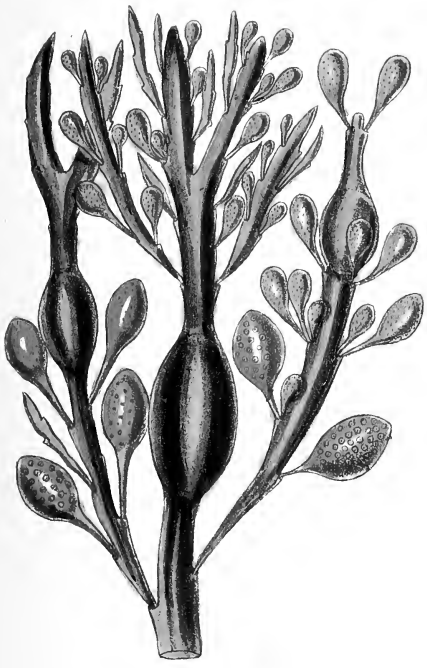
Air-vessels. None.

Fructification. Minute seeds (*spores*) in special receptacles springing from the centre of the frond, like narrow thongs of leather; several times branched in a forked manner (*dichotomously*); dark olive-green; slimy.

Habitat. On rocky shores generally. From low water-mark up to half-tide level.

Rocks covered with the long slimy receptacles of this plant are dangerous walking ground. The usual comparison of a peg-top is retained in the above description; but to some eyes the one-year-old fronds of this species look like pale olive-coloured mushrooms or buttons, dotted about the rocks. The receptacles have a special parasite of their own; *Elachista scutulata*; a minute alga dotted about the thongs, like dark warts; for which see Plate XVI. Fig. 65. And another of the same family is frequently met with upon them; *Elachista velutina*; see Plate XVI. Fig. 67.

13.



Fucus nodosus, Linn.

14.



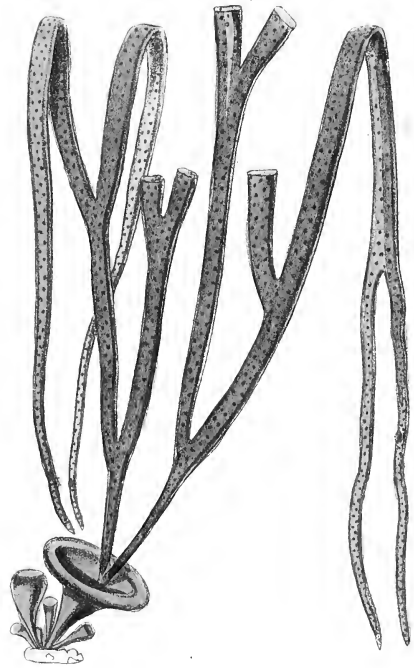
Fucus Mackain, Turv.

15.



Fucus canaliculatus, Linn.

16.



Himanthalia lorea, Lyngb.

PLATE V.

Fig. 17. DESMARESTIA LIGULATA.

Colour. When growing, a clear olive-brown; on exposure to the atmosphere, a verdigris-green; when dry, sometimes yellow; sometimes a pleasant green; semi-transparent.

Substance. Delicately membranaceous. Becoming limp (*flaccid*) after exposure to the air. Recovering itself when dry.

Character of Frond. Flat; with an obscure midrib towards the base; branched. Branching on each side of the stem; the branches branched again and again (repeatedly *pinnate*). Branches and branchlets in pairs exactly opposite each other, and all tapering at each end. The whole frond at one level as if cut out of paper (*distichous*). In youth the margins of the branches are fringed with minute tufts of cobweb-like fibres, which fall off as the plant advances in age.

Measurement. From 2 to 6 feet long; width varies very much.

Fructification. Not ascertained.

Habitat. South of England; occasionally north-east (Filey). All round the coast of Ireland. Between tide-marks, on rocks and stones.

In the north-west of Ireland a variety occurs, which is sometimes from 1 to 2 inches wide; called *D. Dresnii* by French botanists.

Fig. 18. DESMARESTIA ACULEATA.

Colour. When fresh and young, stems green olive; tufts bright green; on exposure to the atmosphere, verdigris-green; when dry, resuming its original hues. In age, brown.

Substance. Tender and membranaceous in youth. Becoming limp and sticky on exposure to the air. Recovering itself when dry. In age, harsh.

Character of Frond. Stem and branches. Stem very short; cylindrical. Branches long; very narrow; slender; flat; repeatedly rebranched. Margins, in youth, fringed with minute tufts of delicate bright green fibres; in age, with thorns.

Measurement. From 1 to 3 feet long.

Fructification. Not ascertained.

Habitat. Our coasts generally. On rocks near low-water mark; common.

A beautiful plant when young, from the bright green tufts which fringe its margins; but ugly when old. All three Desmarestias should, during collection, be kept apart from delicate red sea-weeds, as they possess some curious power of decomposing their more fragile neighbours.

Fig. 19. DESMARESTIA VIRIDIS.

Colour. When growing, a fine chestnut-olive; on exposure to air, turning verdigris-green; when dry, resuming its proper hue.

Substance. Tender and soon decomposing when gathered. Clinging in a sticky lump when exposed to the air. Recovering itself when dry.

Character of Frond. Thread-like, long, excessively branched. Branching uniformly opposite, on each side the stem, like a feather (*pinnate*). Branches repeatedly branched; always in the same manner; becoming finer in every series, till they resemble hairs.

Measurement. From 1 to 3 feet long.

Fructification. Not ascertained.

Habitat. Our shores generally. Between tide-marks; not uncommon.

Easy of detection from its exactly opposite branching throughout the whole frond. Though thread-like (*filiform*) in growth, it flattens when dried and pressed.

Fig. 20. ARTHROCLADIA VILLOSA.

Colour. Pale olive-green.

Substance. When fresh, stiff; soon becoming limp (*flaccid*) on exposure to the air.

Character of Frond. Thread-like, long, very slender stems; several from one base; branched. Branches distant, horizontal; on each side the stem; commonly opposite. Branchlets the same. Frond encircled (*whorled*) at short intervals with minute knobs (*nodes*) bearing very delicate, pale-green, jointed, threads (*filaments*).

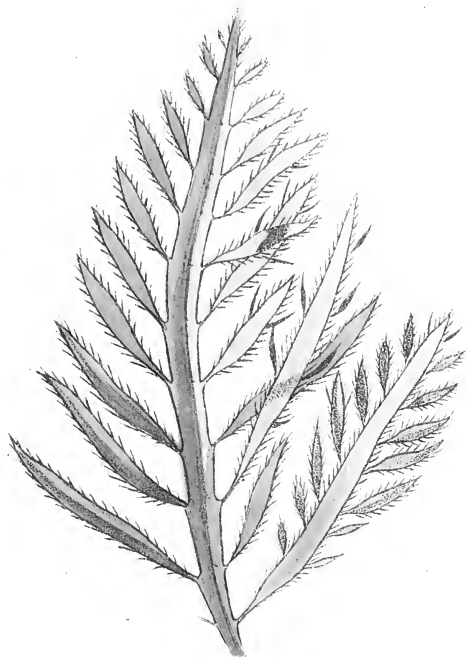
Measurement. From 6 inches to nearly 3 feet long.

Fructification. Minute seeds (*spores*) in tiny pod-like receptacles, borne upon the hair-like filaments which surround the stems.

Habitat. South of England, Frith of Forth, Wicklow and Downshire coasts. Rather rare.

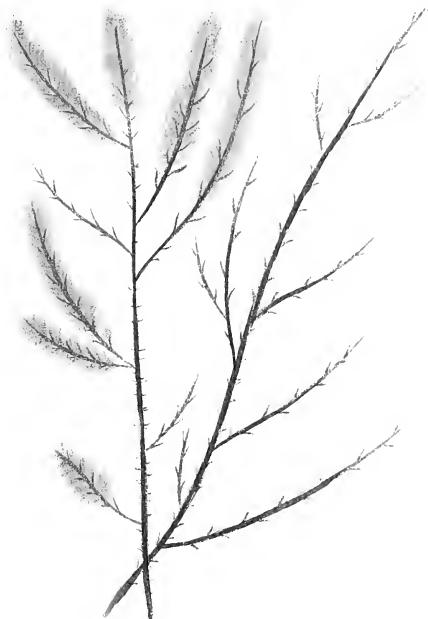
The distance of the branches from each other in this species characterises it even to those who do not look close enough to observe the *whorls* round the stems.

17.



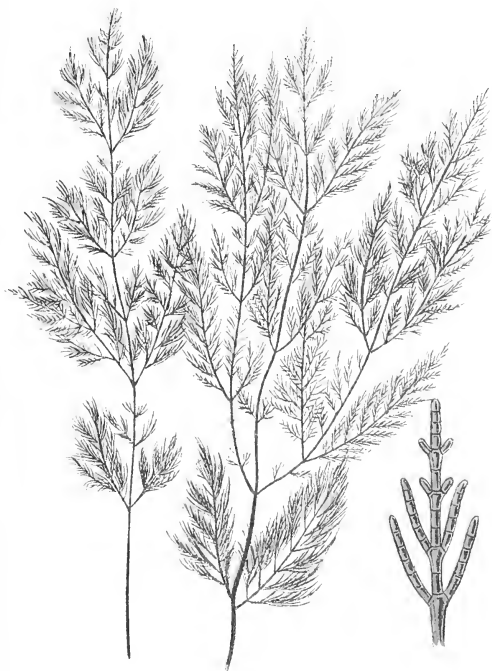
Desmarestia ligulata, Lamour.

18.



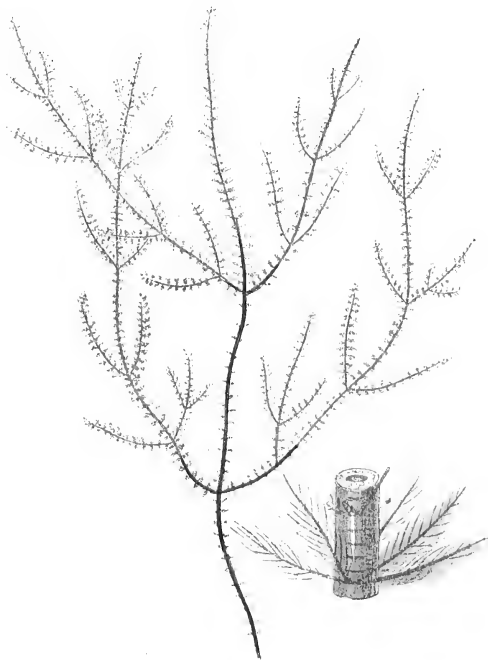
Desmarestia aculeata, Lamour.

19.



Desmarestia viridis, Lamour.

20.



Arthrocladia villosa, Duby.

PLATE VI.

Fig. 21. SPOROCHNUS PEDUNCULATUS.

Colour. When fresh, olive-brown ; on exposure, yellow-green ; its tufts when present, bright green.

Substance. Membranaceous ; soft ; delicate.

Character of Frond. A thread-like, long, simple stem, with long, slender, simple branches on each side. The whole frond crowded with very small, stalked receptacles.

Measurement. From 6 to 18 inches long.

Fructification. Minute seeds (*spores*) in very small, stalked receptacles, borne on the branches ; each tipped with a crest of the finest, hair-like, bright green filaments, which fall off as the plant advances in age.

Habitat. Eastern and southern shores of England and Ireland ; not very uncommon. Frith of Forth, Bridlington, Isle of Man, Portrane, &c.

Fig. 22. CARPOMITRA CABRERÆ.

Colour. Delicate olive-green.

Substance. When fresh, firm ; rather gristly.

Character of Frond. Very narrow ; flat ; obscurely midribbed ; branched. Branching forked (*dichotomous*), but not quite regularly so. Occasionally contracted as if drawn in. Root woolly.

Measurement. From 6 to 8 inches long.

Fructification. Minute seeds (*spores*) in special receptacles at the tips of the branches.

Habitat. South of England. Plymouth Sound. Ireland, Youghal, Co. Cork. Very rare. Thrown up from deep water.

The receptacles are called mitre-shaped, but the resemblance is not startling.

Fig. 23. ALARIA ESCULENTA.

Colour. A fine, bright olive when young; olive-brown when old.

Substance. Thin and tender, all but the midrib, which is gristly.

Character of Frond. A long, flat, ribbon-like, midribbed leaf. It grows on a stem, which at a certain age puts forth several small, flat, ribless leaflets on each side. Margins entire, except when torn. Root fibrous.

Measurement. From 2 to 12 feet or more, long.

Fructification. Minute seeds (*spores*) imbedded in the leaflets which fringe the stem, thickening and darkening them.

Habitat. Our northern shores generally. On rocks at low water-mark.

Plentiful in the lower ledges of rocks on the north side of Filey Bridge. The midrib is said to be eaten in many places.

Fig. 24. LAMINARIA DIGITATA.

Colour. From green to brownish olive; varying according to age.

Substance. Very tough; leathery.

Character of Frond. A flat, leafy expansion; ribless; growing from a stem. *Stem*, when full-grown, solid; woody; as thick as a walking-stick; from 1 to 6 feet long. *Expansion*, rounded below; above, cut (except in extreme infancy) into several narrow slips (*segments*). Root, woody fibres.

Measurement. Stem, from 1 to 6 feet long. Expansion, from 1 to 5 feet long; from 1 to 3 feet wide.

Fructification. Minute seeds (*spores*) imbedded here and there in the surface of the frond, thickening it, and forming cloudy patches.

Habitat. Our coasts generally. On rocks at low-water mark; common.

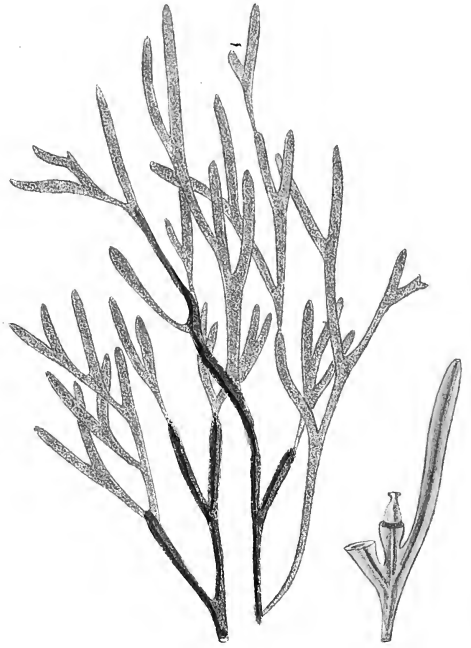
Popularly known as "The Great Tangle," "Oar-weed," or "Sea Girdles." The figure represents a plant which has just changed its coat; having grown a new one and thrust the old out of house and home! A sort of moulting in fact, on the principle of a deciduous tree, changing its leaves. The stem should have been coloured darker, being the older growth. The process is characteristic of the Laminarias.

21.



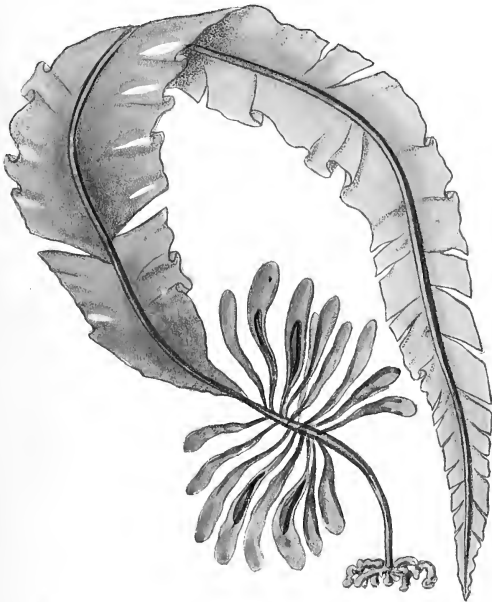
Sporochnus pedunculatus, Ag.

22.



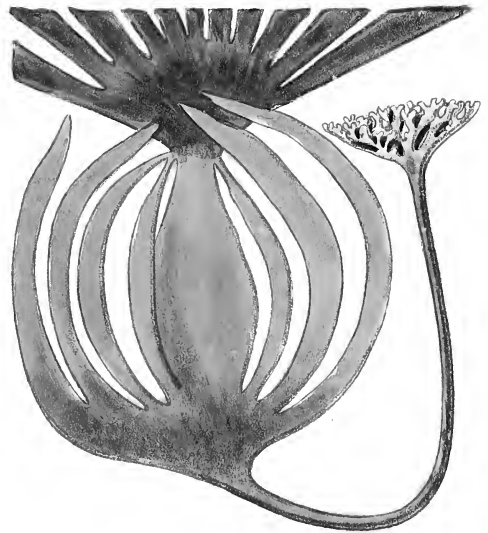
Carpomitra Cabreres, Kütz.

23.



Alaria esculenta, Græv.

24.



Laminaria digitata, Lamour.



PLATE VII.

Fig. 25. LAMINARIA DIGITATA. Var. STENOPHYLLA.

Colour. Dark brown.

Substance. Tough ; leathery.

Character of Frond. A flat, leafy expansion ; ribless ; growing from a stem. *Stem*, slender, soft, glossy. *Expansion*, wedge-shaped below ; above, cut into a few narrow slips (*segments*), longer than the stem. Root fibrous.

Measurement. From 3 to 6 feet long.

Fructification. As before.

Habitat. The Orkney Islands. North and west of Ireland. Probably elsewhere, but overlooked.

Dr. Harvey considers this a remarkable variety of *Lam. digitata*, if not a separate species. He says the Orkney kelp-men distinguish the two by name ; this being called "Tangle;" the common *L. digitata*, "Cury." French botanists make a species of it.

Fig. 26. LAMINARIA BULBOSA.

Colour. Dark ; opaque ; reddish or greenish brown ; glossy ; when dry, black.

Substance. Tough ; leathery.

Character of Frond. A flat leafy expansion ; ribless ; growing from a stem. *Stem*, flat, with a thin waved margin ; once twisted at the base ; rising from a roundish, hollow, rough bulb ; throwing out numerous, stout, fibrous roots. *Expansion*, deeply cut into many narrow slips (*segments*).

Measurement. *Stem*, a foot or more long. *Expansion*, from 6 to 12 feet long, and 1 to 2 feet wide.

Fructification. Minute seeds (*spores*) imbedded here and there in the surface of the frond, thickening it, and forming cloudy patches.

Habitat. Our coasts generally. In deep water, frequent.

Popularly called "Sea Furbelows," from the waved margins. The bulb has been found a foot in diameter.

Fig. 27. LAMINARIA LONGICRURIS.

Colour. A beautiful pale-green olive; the stem yellowish brown.

Substance. Thin; tender; very delicate.

Character of Frond. A flat, leafy expansion; ribless; growing from a stem. *Stem*, very long; slender at each end; swollen and hollow above the middle. *Expansion*, oval; with a wavy curled margin, as if frilled. Root fibrous.

Measurement. Stem, from 8 to 12 feet long. Expansion, from 6 to 8 feet long; from 2 to 3 feet wide.

Fructification. Minute seeds (*spores*) imbedded here and there in the surface of the frond, thickening it, and forming cloudy patches.

Habitat. Abundant on N. American shores from Greenland to Cape Cod. Occasionally drifted to the coasts of Scotland and Ireland by oceanic currents.

But alas! only the *stems* of this fine plant have ever reached us; the delicate membranous leaf being always torn away in the voyage. Nevertheless, it is well to look out carefully, for a happy accident may bring us a complete frond some day. The stems are easily known from all others by their being hollow (*tubular*).

Fig. 28. LAMINARIA SACCHARINA.

Colour. When young, greenish olive; brownish when old.

Substance. When young, thin; more or less delicate; leathery when old.

Character of Frond. A flat, leafy expansion; ribless; growing from a stem. *Stem*, always short in proportion to expansion. *Expansion*, ribbon-like, long, and narrow. Margins sometimes wavy and curled, sometimes smooth. Frond sometimes puckered down the sides. Root fibrous.

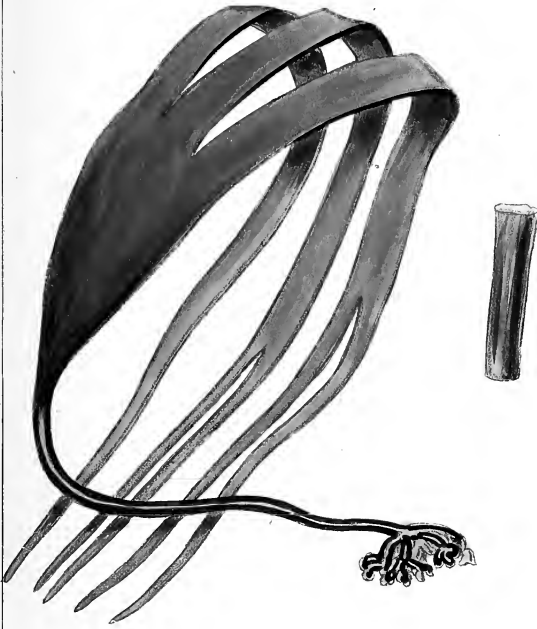
Measurement. Stem, from a few inches to several feet long. Expansion, from 2 to 12 feet long; from 4 to 16 inches wide.

Fructification. Minute seeds (*spores*) imbedded here and there in the surface of the frond, thickening it, and forming cloudy patches.

Habitat. Our coasts generally. On rocks at low-water mark, and in deep water; common.

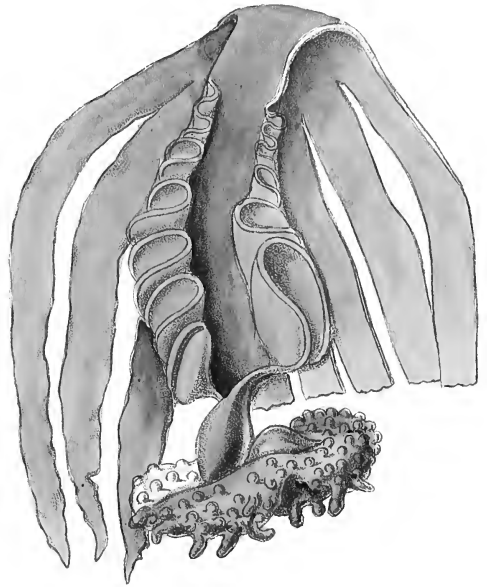
There may be a danger of confounding this plant, when young, with *L. Phyllitis*. Nevertheless, it is at all times thicker in substance, darker in colour, and more abrupt in growth at the base. Popularly called "The Devil's apron."

25.



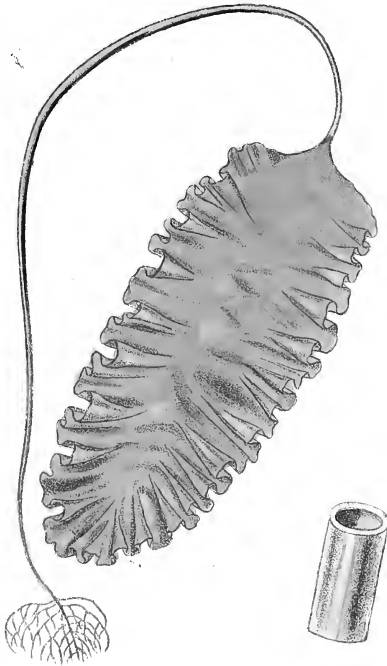
Laminaria digitata, Lamour.
(var. *stenophylla*)

26.



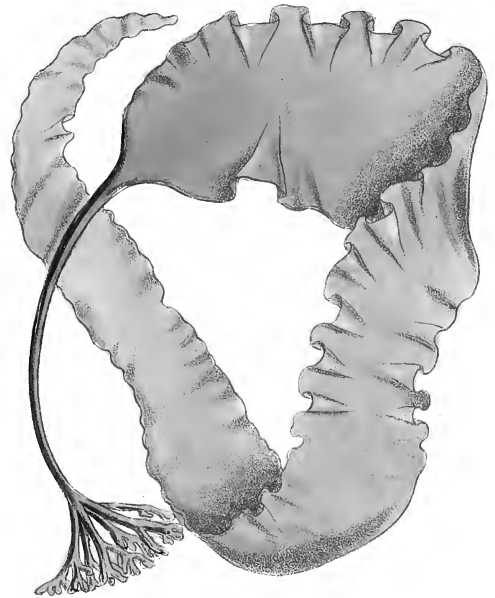
Laminaria bulbosa, Lamour.

27.



Laminaria longicuris, de la Bzl.

28.



Laminaria saccharina, Lamour.

PLATE VIII.

Fig 29. LAMINARIA PHYLLYTIS.

Colour. Pale, yellowish green.

Substance. Thin and tender ; delicately membranaceous ; retaining these characters when old.

Character of Frond. A flat, leafy expansion ; ribless ; growing from a stem. *Stem*, always short in proportion to the *expansion*. *Expansion*, ribbon-like, very long and narrow, tapering gradually at each end. Margins wavy at times, yet scarcely as much curled as in *L. saccharina*. Root, fibrous.

Measurement. Stem, from 1 to 2 inches long. Expansion, from 8 inches to 3 feet long ; from 1 to 6 inches wide.

Fructification. Minute seeds (*spores*) imbedded here and there in the surface of the frond, thickening it, and forming cloudy patches.

Habitat. Our coasts generally. Between tide-marks, and at extreme low-water, on rocks and in pools left by the tide. Not uncommon.

The tapering ends and more marked narrowness throughout, are guides to this plant, as well as its very delicate substance. When grown to its greatest length it never becomes leathery, coarse, or brown, like *L. saccharina*. Tufts of it grow together among boulders at extreme low-water mark, as on The Spittals, Filey.

Fig. 30. LAMINARIA FASCIA.

Colour. Olive, or olive-brown.

Substance. Membranaceous, but not quite so delicate as *L. Phyllytis*.

Character of Frond. A flat, leafy expansion ; ribless ; growing from a stem. *Stem*, very short. *Expansion*, often widening upwards, becoming blunt at the end ; sometimes narrow throughout ; sometimes wider below, and tapering upwards. Root, a minute disk.

Measurement. Stem, when longest, $\frac{1}{2}$ an inch ; passing insensibly into the frond. Expansion, from 4 to 12 inches long. Width, from $\frac{1}{6}$ of an inch to an inch or two.

Fructification. Minute seeds (*spores*) imbedded here and there in the surface of the frond, thickening it, and forming cloudy patches.

Habitat. Our shores generally. On mud-covered rocks. Not uncommon.

The little disk-like root stamps this species whenever it can be found ; and the thick, dark, olive hue is another strong feature.

Fig. 31. CHORDA FILUM.

Colour. Dark olive-brown.

Substance. Gristly and very firm when recent ; slimy ; slipping through the fingers.

Character of Frond. Perfectly simple. Like long boot-laces ; one from each minute disk-like root ; growing in large companies, in sandy or muddy bottoms ; cylindrical ; tapering at both ends, clothed with pellucid hairs.

Measurement. From 1 to 20, or even 40 feet long in deep water. From $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter. About as thick as a round slate-pencil.

Fructification. Minute seeds (*spores*) covering the whole surface of the frond.

Habitat. Our shores generally. From between tide-marks to ten or fifteen fathoms of water. Very abundant.

What has been considered a small variety, *C. tomentosum*, is densely covered with olive or green cobweb-like hairs. But Dr. Harvey believes this to be the case with all the *infant* plants of this species.

Fig. 32. CHORDA LOMENTARIA.

Colour. Brownish or yellowish olive.

Substance. Soft, membranaceous.

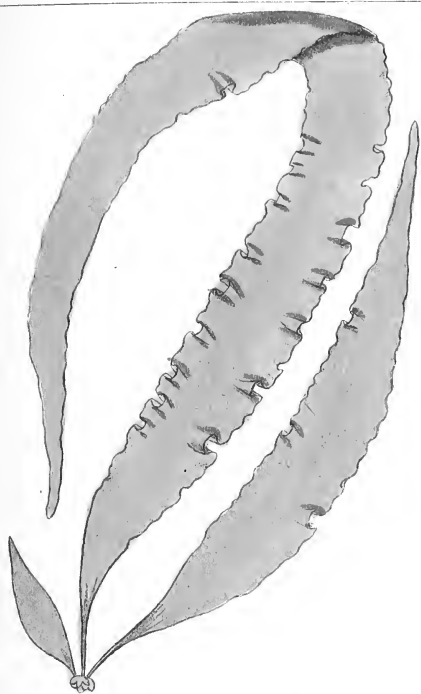
Character of Frond. Perfectly simple. When young, like boot-laces, each from a minute disk-like root ; more delicate in quality than *C. filum* ; cylindrical ; tapering at both ends ; when full-grown, contracted at intervals as if tied in ; the intervals inflated.

Measurement. From 3 to 16 inches long. One-third of an inch in diameter when largest. Often much smaller.

Fructification. Minute seeds (*spores*) covering the whole surface of the frond.

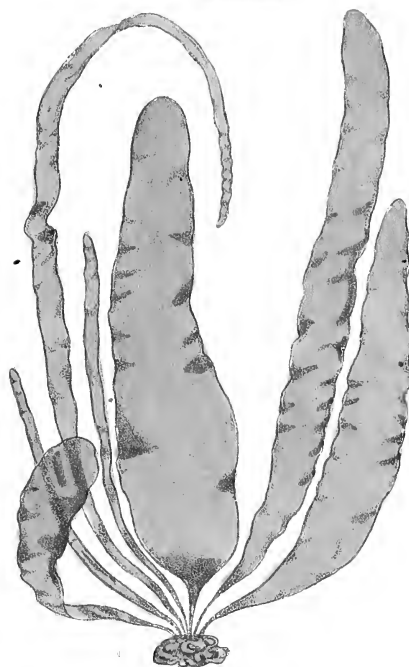
Habitat. Our coasts generally. On rocks and stones between tide-marks. Common.

29.



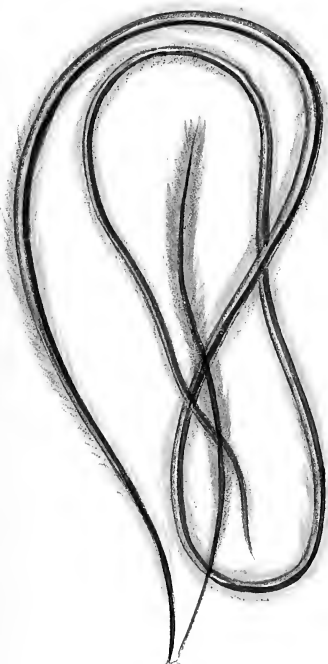
Laminaria phyllitis, Lamour.

30.



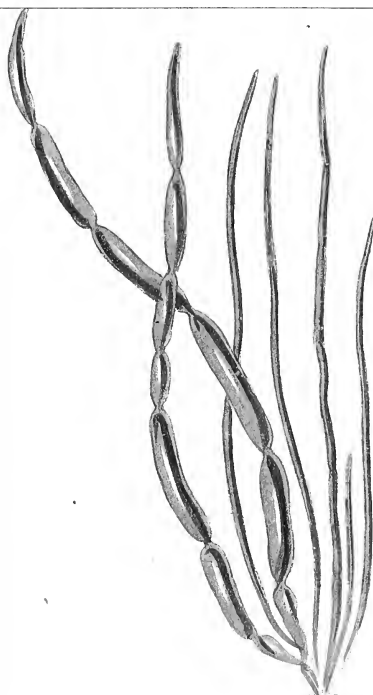
Laminaria fasciata, Ag.

31.



Chorda filum, Lamour.

32.



Chorda lomentaria, Ly. gb.

PLATE IX.

Fig. 33. CUTLERIA MULTIFIDA.

Colour. Olive-green, varied with rusty tints.

Substance. When fresh, firm, thick ; membranaceous ; soon becoming limp.

Character of Frond. A flat expansion ; many times variously slit in the upper part ; tips of the segments pointed. General outline rather fan-shaped. Beautifully marked by the prominent dots of fructification, of darker hue than the frond. Root, woolly.

Measurement. From 2 to 8 inches long.

Fructification. Dot-like tufts of seeds (*spores*) scattered over both surfaces of the plant.

Habitat. Coasts of England and Ireland. Very rare in Scotland. On rocks and shells in from 4 to 15 fathom water. Rare.

Fig. 34. HALISERIS POLYPODIOIDES.

Colour. Brownish olive ; semi-transparent.

Substance. Thin ; membranaceous ; very easily torn.

Character of Frond. Flat ; midribbed ; narrowish throughout ; branched. Branches forked (*dichotomous*), though not perfectly so. Margins entire. In tufts from a woolly root.

Measurement. From 4 to 12 inches long ; about $\frac{1}{2}$ an inch wide.

Fructification. Minute seeds (*spores*) in oblong patches along each side of the midrib ; or large single ones irregularly scattered.

Habitat. South of England, West and South of Ireland. Rocks and stones in the sea at from 2 to 5 fathoms depth. Rare.

When fresh its strong, disagreeable odour is a mark of distinction.

Fig. 35. PADINA PAVONIA.

Colour. Olive-green shaded with rust colour ; striped with lines across ; some of these fringed with orange-coloured hairs ; others dark. Outer surface powdered with white.

Substance. Leathery and opaque below ; above, delicately membranaceous and transparent.

Character of Frond. A fan-like, semi-circular expansion ; ribless ; entire or slit into segments ; each becoming fan-shaped in time. Margins rolled backwards ; sometimes fringed with hairs. When young, growing in a curled, rolled-up manner (see figure). When old, expanded. Root woolly.

Measurement. From 2 to 5 or 6 inches high.

Fructification. Minute seeds (*spores*) on the upper surface of the frond, lying in bands across it ; in fact, forming the *darker* striped lines described above.

Habitat. Southern shores of England. On rocks in shallow tide-pools at half-tide level. Rare.

A beautiful plant, supposed to resemble an outspread peacock's tail. The iridescent tints which its lines fringed with hairs give out in the water, assist this idea, suggested originally by its shape.

Fig. 36. TAONIA ATOMARIA.

Colour. Brownish olive, varied with green and rust tints ; striped with lines across.

Substance. Thin ; transparent ; membranaceous.

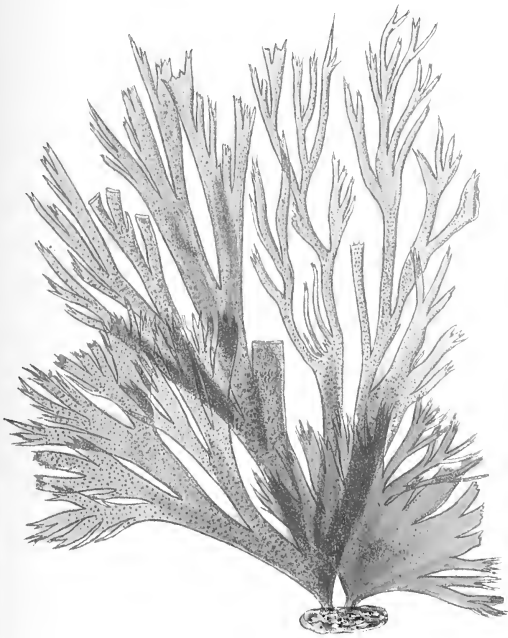
Character of Frond. A flat expansion, deeply slit into many segments ; several from a base. General outline rather fan-like ; segments wedge-shaped. Tips blunt.

Measurement. From 3 to 12 inches long. Width of segments very irregular.

Fructification. Minute seeds (*spores*) on both surfaces of the frond ; some forming waved lines across ; some scattered irregularly between.

Habitat. East and South of England. Frith of Forth. South of Ireland. On rocks between tide-marks. Rare.

33.



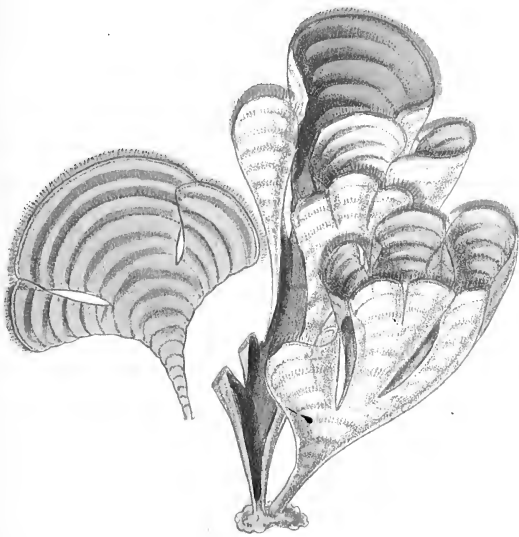
Cutleria multifida, Grev

34.



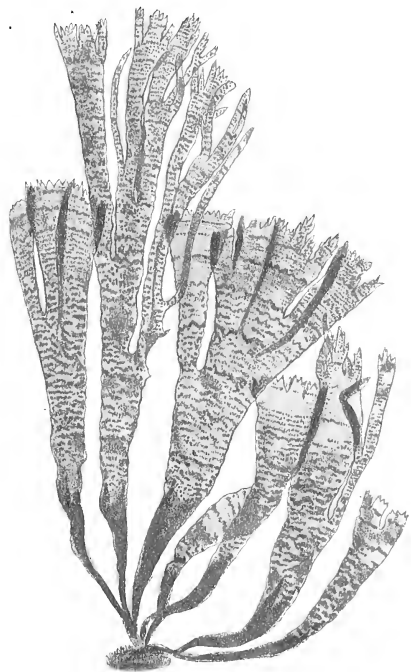
Haliseris polypodioides, Ag

35.



Padina Pavonia, Lamar

36.



Taonia atomaria, Grev

PLATE X.

Fig 37. DICTYOTA DICHOTOMA.

Colour. Olive ; more or less green or brown.

Substance. Thin ; semi-transparent ; membranaceous.

Character of Frond. Flat ; ribless ; narrowish throughout ; branched. Branching, forked (*dichotomous*) throughout ; the frond becoming narrower upwards. Margins entire. Root woolly.

Measurement. From 3 to 12 inches long. Width varying from $\frac{1}{3}$ of an inch to an almost hair-like fineness. The average width is represented in the figure.

Fructification. Minute seeds (*spores*) on both surfaces of the frond ; either in oval clusters or irregularly scattered.

Habitat. Our shores generally. On rocks and sea-plants between tide-marks. Common.

The narrow variety (*D. intricata*) is troublesome to lay out ; being truly "much branched, twisted, and entangled."

Fig. 38. STILOPHORA RHIZODES.

Colour. A greenish olive when young ; when old, foxy brown.

Substance. Elastic and gristly when fresh, but soon turning soft and gelatinous in fresh water.

Character of Frond. Thread-shaped (*filiform*) ; solitary or tufted ; branched. Branching irregular ; mostly forked (*dichotomous*) ; occasionally alternate. Root, a disc.

Measurement. From 6 inches to 2 feet long.

Fructification. Minute seeds (*spores*) in convex, wartlike clusters, densely covering the surface of the frond, and giving it a dotted appearance.

Habitat. Shores of England and Ireland, Jersey. Near low water-mark, growing on rocks or algæ.

Fig. 39. STILOPHORA LYNGBYÆI.

Colour. A pale olive-brown, or foxy; becoming greenish olive in drying.

Substance. Membranaceous; crisp at first and fragile, soon turning soft.

Character of Frond. Thread-shaped (*filiform*), tufted, branched. Branching profuse, almost always forked (*dichotomous*); spreading; the tips very fine.

Measurement. From 2 to 4 feet long, or more.

Fructification. Minute seeds (*spores*) in convex, wart-like clusters, in lines encircling the branches; not nearly so thickly set as those of *S. rhizodes*.

Habitat. Land-locked bays on the coasts of Scotland and Ireland; dredged in from 4 to 10 fathom water.

S. rhizodes always grows within tide-marks. *S. Lyngbyæi* is only obtained from deep water. Dr. Harvey doubts of their being two distinct species.

Fig. 40. DICTYOSIPHON FÆNICULACEUS.

Colour. A greenish or brownish olive, according to age.

Substance. Membranaceous; soft; slippery to the touch when young, yet not gelatinous.

Character of Frond. Thread-shaped (*filiform*), tufted very fine. Very much branched and bushy. Main stem set with long, alternate branches on each side; branches re-branched once or twice; becoming hair-like at last. When young covered with colourless cobweb-like hairs, which die off afterwards.

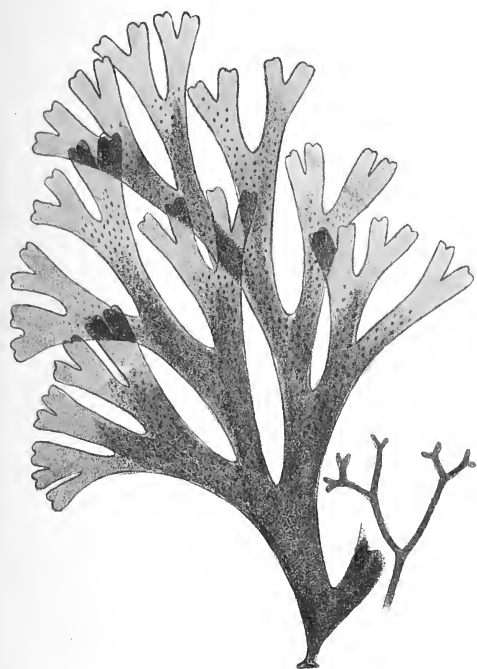
Measurement. From 1 to many feet long.

Fructification. Minute seeds (*spores*) either solitary or clustered; scattered over the surface of the frond.

Habitat. Our coasts generally. Between tide-marks in pools, on rocks, or on other Algæ.

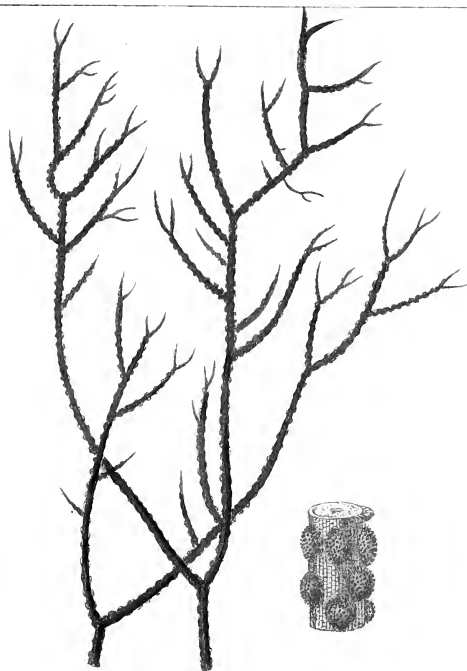
In general appearance like *Desmarestia viridis*, but the exactly *opposite* branching of that, and the *alternate* of this, perfectly distinguish the one from the other. The slippery feeling of young plants is produced by the hairs.

37.



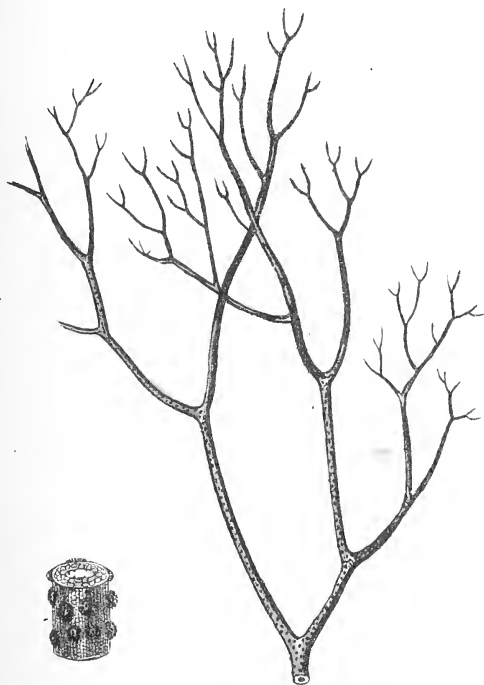
Dictyota dichotoma, Lamour

38.



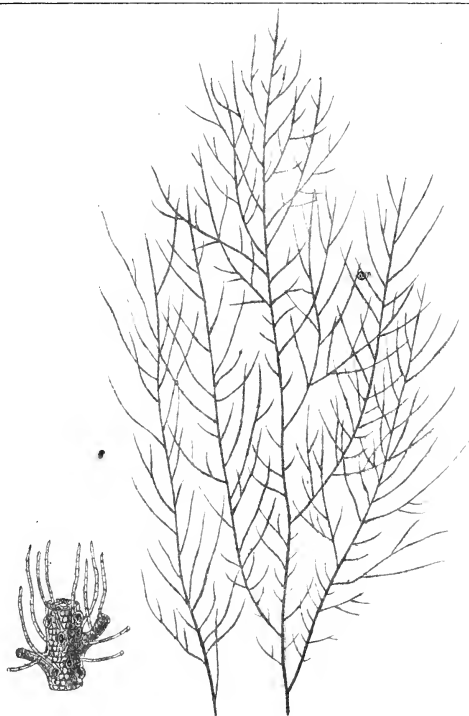
Stilophora rhizodes, J.Ag.

39.



Stilophora lyngbyæi, J.Ag.

40.



Dictyosiphon foeniculaceus, Grev.



PLATE XI.

Fig. 41. STRIARIA ATTENUATA.

Colour. Pale olive.

Substance. Delicately membranaceous.

Character of Frond. Thread-shaped (*filiiform*); tufted; branched. Stem branched on each side. Branches long, simple; or sometimes re-branched. Branches and branchlets mostly opposite; tapering at each end; marked, when in fructification, with dark rings or bands. Root, a disc.

Measurement. From 3 to 12 inches long.

Fructification. Minute seeds (*spores*) in clusters (accompanied by fibres), forming rings or bands round the branches.

Habitat. Our coasts generally. Growing on other algæ between tide-marks, and in from 4 to 5 fathom water.

The mode of branching varies occasionally; but the marked character of tapering extremities never fails.

Fig. 42. PUNCTARIA LATIFOLIA.

Colour. Pale olive-green; sometimes darker in age.

Substance. Thin; delicately membranaceous; semi-transparent; almost gelatinous when young; afterwards coarser.

Character of Frond. A leafy expansion; flat; ribless; more or less oblong; tapering suddenly at the base into a short stem; tip sometimes obtuse, and sometimes pointed; margins wavy; growing in tufts.

Measurement. From 8 to 16 inches long; from 1 to 3 wide.

Fructification. Dot-like groups of seeds (*spores*) scattered over both surfaces of the frond.

Habitat. Sidmouth and Torquay. Belfast and west of Ireland. On rocks and algæ between tide-marks. Not very common.

Fig. 43. PUNCTARIA PLANTAGINEA.

Colour. Brownish-olive ; often full brown.

Substance. Tough, though membranaceous. Sub-opaque.

Character of Frond. A leafy expansion ; flat ; ribless ; more or less pointed (*lanceolate*) ; tapering gradually to the base from near the middle of the frond.

Measurement. From 4 to 12 inches long ; from $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches wide.

Fructification. Oblong, largish groups of seeds (*spores*) scattered over both surfaces of the frond.

Habitat. Our coasts generally. On rocks, &c., between tide-marks. Not uncommon.

Sometimes confounded with *Laminaria fasciata*. But the *Laminaria* is more glossy ; adheres less firmly to paper ; and its texture, when examined through a microscope or lens, is seen to be much more close and compact than that of the *Punctaria*, which has a comparatively loose, reticulated (net-like) structure.

Fig. 44. ASPEROCOCCUS COMPRESSUS.

Colour. A yellowish, or olive-green.

Substance. Tender ; membranaceous.

Character of Frond. A leafy expansion ; compressed ; ribless ; narrow ; tapering near the base into a hair-like stem, occasionally contracted at intervals as if drawn in.

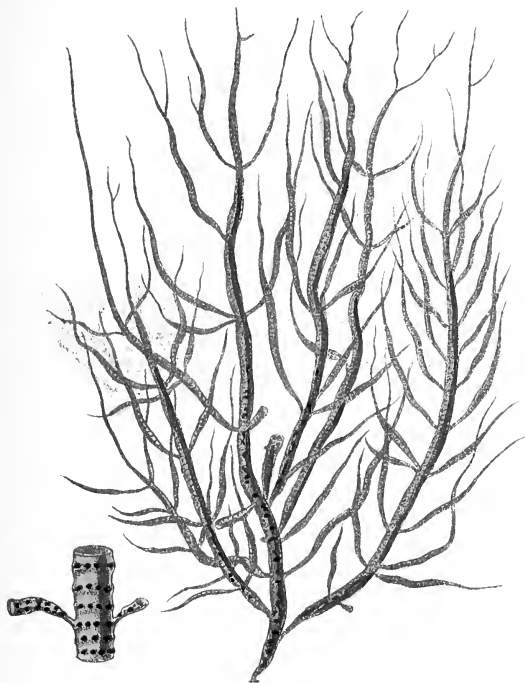
Measurement. From 6 to 18 inches long ; from $\frac{1}{4}$ to 1 inch wide.

Fructification. Oblong, irregular clusters of seeds (*spores*), scattered over both surfaces of the frond.

Habitat. South of England. Cast up from deep water. Rare.

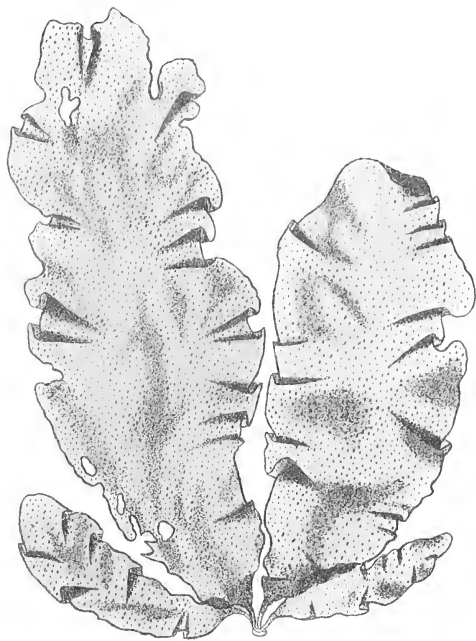
Formed of two membranes, close-pressed, and adhering. A species intermediate between *Punctaria* and the more characteristic *Asperococci*, which are tubular and inflated.

41.



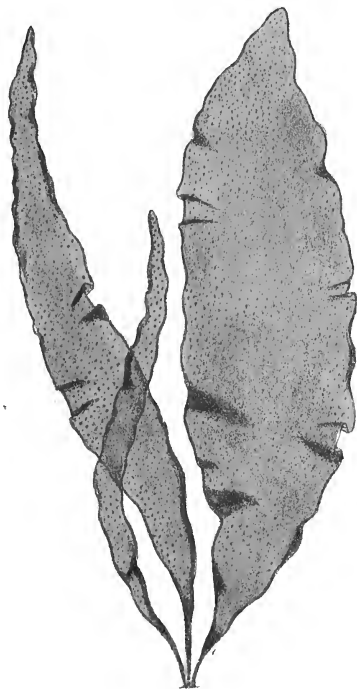
Striaria attenuata, Grev.

42.



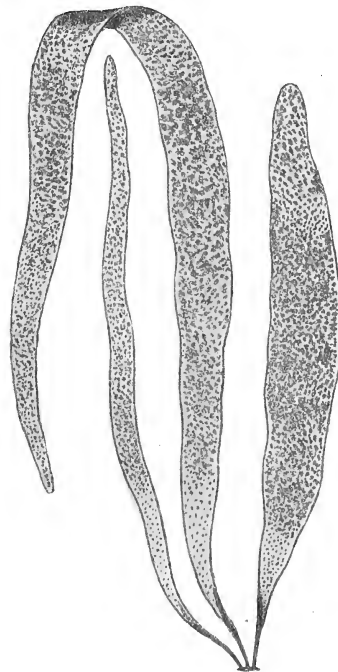
Punctaria latifolia, Grev.

43.



Punctaria plantaginea, Grev.

44.



Asperococcus compressus, Griff.

PLATE XII.

Fig. 45. ASPEROCOCCUS TURNERI.

Colour. Pale olive, when young; olive-brown, in age.

Substance. Thin; delicately membranaceous; semi-transparent.

Character of Frond. Tubular; inflated; oblong; obtuse at the tips; suddenly contracted at base into a short stem. Contracted at intervals, as if tied in, sausage fashion!

Measurement. From 8 inches to many feet in length; from $\frac{1}{2}$ to 2 or 6 inches thick.

Fructification. Dot-like clusters of seeds (*spores*) scattered over the surfaces of the frond.

Habitat. Our coasts generally. On stones, and the larger algæ, between tide-marks.

Known from *A. compressus* by being inflated; from *A. echinatus*, by its more transparent delicate texture, constrictions, and greater inflation of frond.

Fig. 46. ASPEROCOCCUS ECHINATUS.

Colour. Yellowish-olive, tending to brown.

Substance. Membranaceous, but coarse and sub-opaque.

Character of Frond. Tubular; narrow; more or less tapering to the base; obtuse, or somewhat tapering, at the tips (the plate does not give the obtuse form, which is nevertheless common).

Measurement. From 2 inches to 2 feet long; from a hog's bristle to $\frac{1}{2}$ an inch in diameter, *i.e.* thick.

Fructification. Dot-like clusters of seeds (*spores*) scattered over the surface of the frond.

Habitat. Our coasts generally. On rocks and algæ between tide-marks. Common.

The great variety of size in this plant is puzzling to young collectors. But even when not thicker than a *hog's bristle* (a curiously favourite measure with phycologists!), it is still *tubular*; and like its relatives (*congeners*), often full of sand!

Fig. 47. CHORDARIA FLAGELLIFORMIS.

Colour. Dark olivaceous green ; inclining to brown.

Substance. Firm and sinewy.

Character of Frond. Thread-like (*filiform*); branched; of equal thickness throughout. Stem branched on each side. Branches long, alternate, mostly simple; occasionally a few branchlets upon them. Fringed all over with fine, colourless hairs, which can only be seen when it is under water, but give it a slimy feel when out.

Measurement. From 3 inches to 3 feet long; from 1 to 2 hog's bristles thick.

Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. Our coasts generally. On rocks and stones between tide-marks. Common.

The hairs give this plant a feathery appearance in the water.

Fig. 48. CHORDARIA DIVARICATA.

Colour. Olive; much paler than *C. flagelliformis*; brown in old age, and when dried.

Substance. Firm and elastic; surface slimy.

Character of Frond. Thread-like (*filiform*), branched; forming globose tufts. Branching partially forked (*sub-dichotomous*). Branches wavy, furnished in the upper part with scattered, short, mostly forked, branchlets.

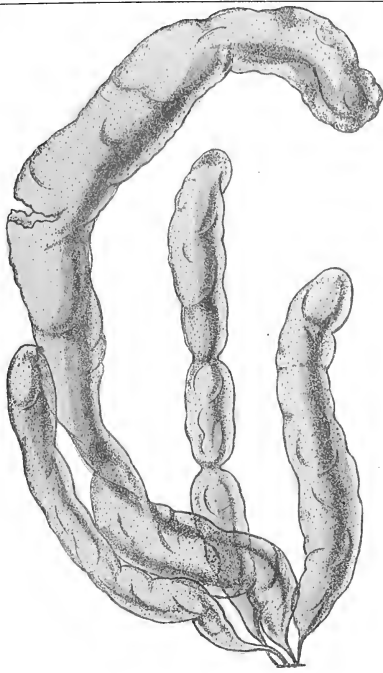
Measurement. From 1 to 3 feet long. A hog's bristle thick.

Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. Belfast and Carrickfergus. Thrown up from deep water. Rare.

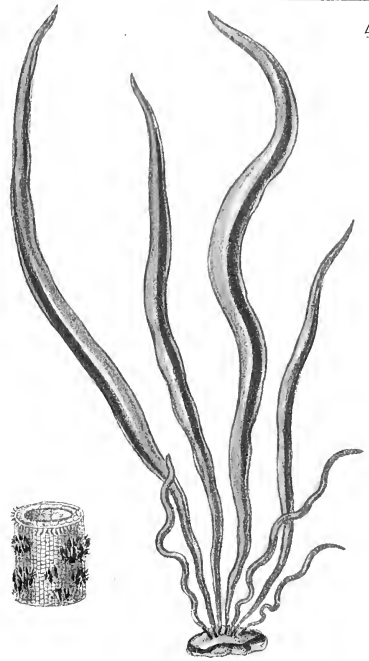
Outwardly resembling *Stilophora rhizodes*.

45.



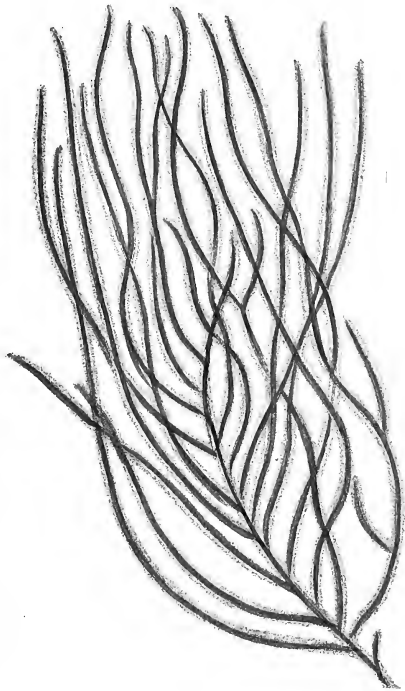
Asperococcus Turneri, Hook.

46.



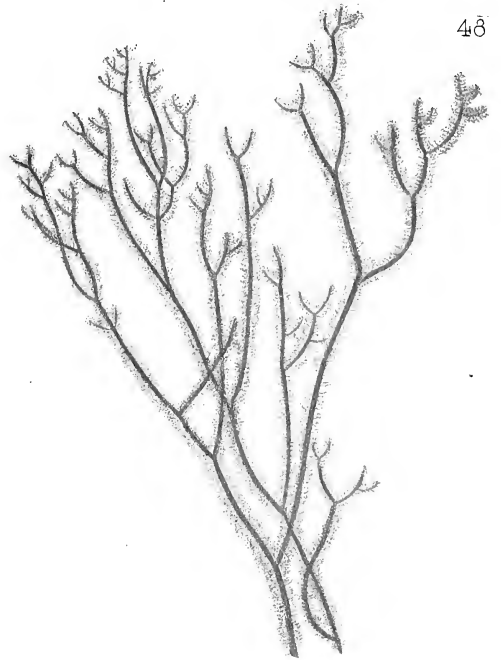
Asperococcus echinatus, Grev.

47.



Chordaria flagelliformis, Ag.

48.



Chordaria divaricata, Ag.



PLATE XIII.

Fig. 49. ZONARIA COLLARIS.

Colour. Olive-green ; obscurely striped across.

Substance. Membranaceous ; delicate.

Character of Frond. A fan-like, circular expansion, lying flat on the rocks ; rooted from its under surface ; sending from its upper one, small saucer-shaped fronds, which in pressing become flat.

Measurement. From 1 to 2 inches across.

Fructification. Minute seeds (*spores*) scattered over the surface of the frond.

Habitat. Jersey ; found by Miss Turner, "lying among other algæ on the sand in Granville Bay."

Dr. Harvey considers the fronds so found to be secondary ones, sprung from the primary *Materfamilias*, adherent to the rock. *Zonarias* differ from *Padinas* in the irregular distribution of their spores. In *Zonaria*, these are scattered ; in *Padina*, grouped in lines or bands. (See Plate IX. Fig. 35.) But the genera are closely allied, and it is only for the artist's convenience that they have been separated in this volume.

Fig. 50. ZONARIA PARVULA.

Colour. Olive-green ; paler in shallow water than in deep.

Substance. Membranaceous ; somewhat transparent.

Character of Frond. Flat ; spreading over rocks in patches of roundish or oval outlines ; rooted by fibrous hairs from its under surface, except towards the margins, which are free and divided into segments. Segments rounded, obscurely marked with lines.

Measurement. From 1 to several inches in diameter.

Fructification. Like that of *Zonaria collaris* ; but it has not been observed in England.

Habitat. Our coasts generally. On rocks and coralines between tide-marks, and in deep water. Not uncommon.

Probably often overlooked from its hiding in crevices, &c.

Fig. 51. PUNCTARIA TENUISSIMA.

Colour. Pale green-olive when young ; brown when old.

Substance. Delicately membranaceous ; very thin ; when young, transparent.

Character of Frond. Very narrow, long, flat ; in tufts, forming a fringe on the fronds of various algæ. Tapering at each end. Margins more or less toothed.

Measurement. From 2 to 8 inches long ; from $\frac{1}{12}$ to $\frac{1}{4}$ of an inch wide.

Fructification. Unknown.

Habitat. Our shores, here and there. On *Chorda filum*, &c. Not common.

For the other *Punctarias* see Plate XI.

Fig. 52. LITOSIPHON PUSILLUS.

Colour. Olive-brown.

Substance. Soft; membranaceous; slimy.

Character of Frond. Long thread-like (*filiform*) tufts; unbranched; of equal thickness throughout; clothed with hairs; growing in patches on old fronds of *Chorda filum*.

Measurement. From 2 to 6 inches long; thickness, a hog's bristle.

Fructification. Minute seeds (*spores*), solitary or in clusters; scattered over the surface of the frond.

Habitat. Our coasts generally. Always parasitic on *Chorda filum*. Common.

This genus is now called, by Continental botanists, *Wyattia*, after Mrs. Wyatt.

Fig. 53. LITOSIPHON LAMINARIÆ.

Colour. Dull olive-brown; marked with bands across.

Substance. Soft; membranaceous.

Character of Frond. Short, thread-like (*filiform*), starry tufts; unbranched; smooth (or hairy at the tips); blunt upwards; scattered dot-like on the frond of *Alaria esculenta*.

Measurement. From $\frac{1}{4}$ to $\frac{1}{2}$ an inch long; thickness, a hog's bristle.

Fructification. Minute seeds (*spores*) solitary, scattered; or several in each band across.

Habitat. Our coasts generally. Always parasitic on *Alaria esculenta*. Common.

Now *Wyattia laminariæ*.

Fig. 54. LEATHESIA TUBERIFORMIS.

Colour. Olive-brown.

Substance. Fleishy; elastic; slippery-feeling.

Character of Frond. More or less globose; forming tubers of various sizes and shapes; full of cottony fibres when young; hollow and inflated when older; adhering to rocks in large patches, or growing on the fronds of other algæ.

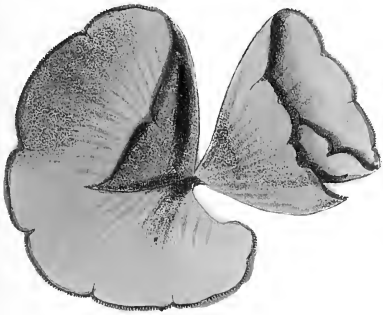
Measurement. Every size, from a pea to a large walnut.

Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. All round our coasts. On rocks and algæ between tide-marks; abundantly.

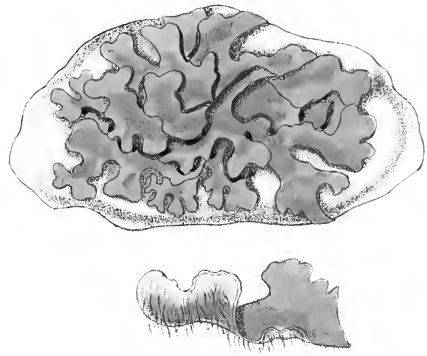
Called *tuberiformis*, or tuber-shaped, from its resemblance "to a cluster of small potatoes."
For another *Leathesia* see Plate XV.

49.



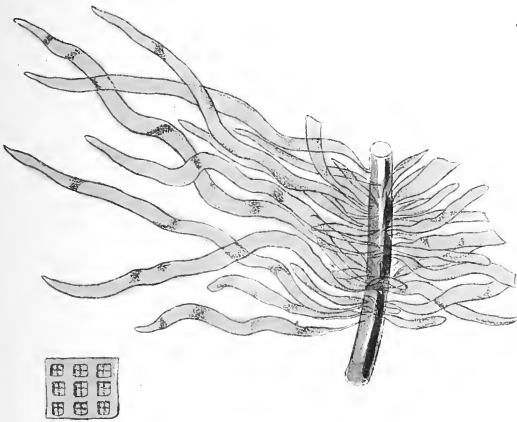
Zonaria collans, Ag.

50.



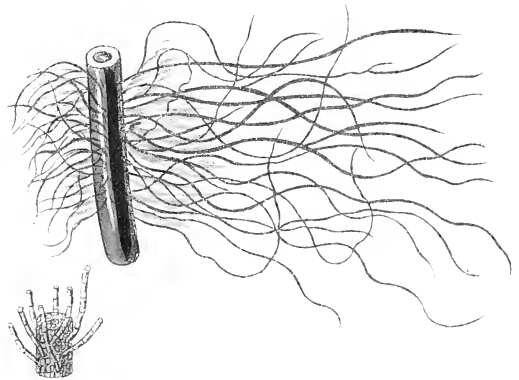
Zonaria parvula, Grev.

51.



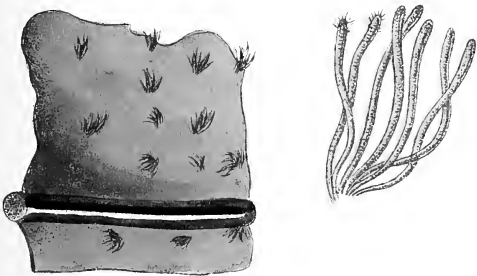
Functaria tenuissima, Grev.

52.



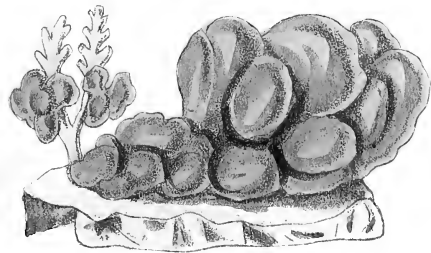
Litosiphon pusillus, Harv.

53.



Litosiphon Laminariæ, Harv.

54.



Leathesia tuberiformis, S.F. Gray.



PLATE XIV.

Fig. 55. MESOGLOIA VERMICULARIS.

Colour. Brownish olive.

Substance. Soft; thick; gelatinous; slipping from the hand.

Character of Frond. Cylindrical; unequally distended; branched. Branches long, worm-like, clumsy, attenuated at each end; irregularly set on a stem which is occasionally forked. Branchlets long, wavy; like the branches.

Measurement. From 1 to 2 feet long.

Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. Our shores generally. On rocks and stones between tide-marks. Pretty common.

The slippery, worm-like feel of the *Mesogloias* renders the family easy of recognition; and *M. vermicularis* is much darker-coloured, thicker, and more clumsily formed than the others.

Fig. 56. MESOGLOIA GRIFFITHSIANA.

Colour. Rather pale olive-green, becoming greener in fresh water.

Substance. Soft; gelatinous; slimy; slipping from the hand.

Character of Frond. Cylindrical, slender, equal throughout; branched. Branches long, nearly simple, on each side a stem; mostly alternate; a few branchlets here and there. Surface covered with colourless, cobweb-like hairs which only show under water.

Measurement. From 8 to 16 inches long. About the thickness of a crow's quill.

Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. South of England. West of Ireland. In rock-pools between tide-marks. Rare.

Very like *Chordaria flagelliformis* in general growth, but differing in structure.

Fig. 57. MESOGLOIA VIRESCENS.

Colour. Olive-green ; often yellowish.

Substance. Soft, gelatinous, slimy ; loose as if likely to tumble to pieces.

Character of Frond. Cylindrical, slender, excessively branched. Branches long, spreading, on each side a stem ; irregularly alternate ; furnished with numbers of short branchlets. The whole frond looking hairy when examined ; partly from its loose structure ; partly from the colourless cobweb-like hairs with which it is clothed.

Measurement. From 8 to 12 inches long. About the thickness of a crow's quill.

Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. Our coasts generally. On rocks, stones, and algæ, at half-tide level. Common.

The structure of the *Mesogloias* is on the model of that of a bottle brush ; namely, a stalk surrounded with bristles. So the *Mesogloias* have a firm, internal stalk (*axis*), with radiating filaments surrounding it. These filaments, however, being delicate, and invested with gelatine, the plants are all slimy-feeling to the touch.

Fig. 58. CLADOSTEPHUS VERTICILLATUS.

Colour. A dull green, inclined to olive ; darker and browner when old.

Substance. Rigid ; harsh.

Character of Frond. Bushy. Branches slender, cylindrical ; partly forked (*dichotomous*), partly alternate or opposite, on each side a stem. Stems and branches frilled (*whorled*) at short intervals with short, incurved branchlets ; which are *jointed*, that is, composed of cells joined together in a line. Many of these drop off during winter.

Measurement. From 3 to 9 inches high.

Fructification. Oval seeds (*spores*) borne on small branchlets which grow irregularly on the frond after the summer frills (*whorls*) die off.

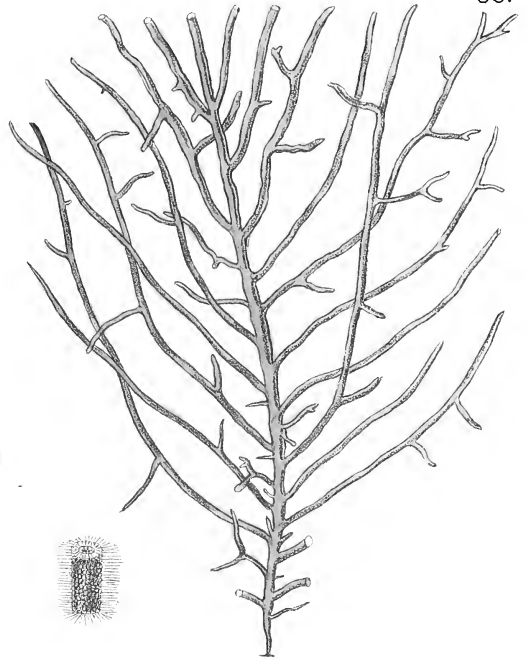
Habitat. Our coasts generally, except the north-east. On rocks and corallines.

55.



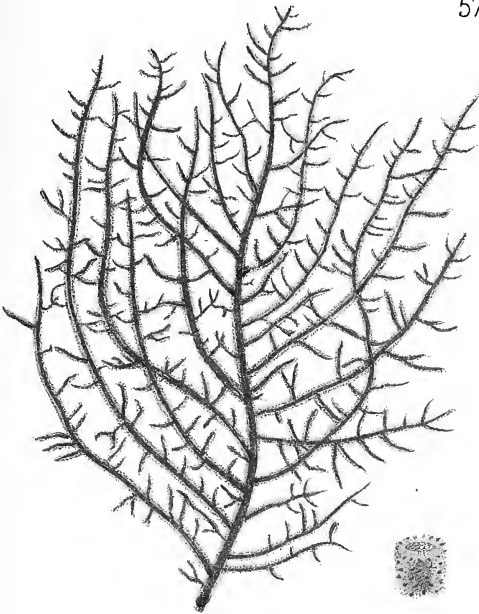
Mesogloia vermicularis, Ag.

56.



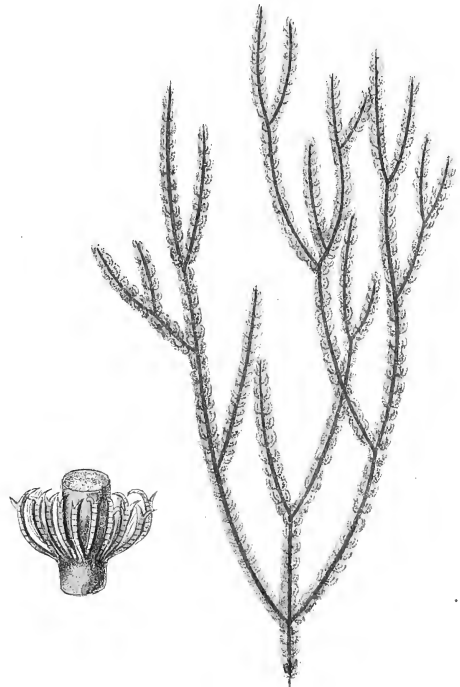
Mesogloia Griffithsiana, Grev.

57.



Mesogloia virescens, Carm.

58.



Cladostephus verticillatus, Ag.

PLATE XV.

Fig. 59. LEATHESIA BERKELEYI.

Colour. Dark brown.

Substance. Fleshy; soft; solid.

Character of Frond. Convex lumps, somewhat depressed; more or less globose; growing in patches upon rocks.

Measurement. From 1 to 2 inches in diameter. From $\frac{1}{4}$ to $\frac{1}{2}$ an inch thick.

Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. South of England. West of Ireland. On rocks between tide-marks.

For another *Leathesia*, see Plate XIV. Fig. 59.

Fig. 60. RALFSIA VERRUCOSA.

Colour. Dark brown.

Substance. Leathery; hard.

Character of Frond. *Crustaceous*; *i. e.* an incrustation, forming lichen-like patches on rocks. When young, circular in outline; becoming very irregular when old. The surface of young specimens flat. That of full-grown ones rough with wart-like prominences.

Measurement. Patches from 1 to 6 inches in diameter.

Fructification. Minute seeds (*spores*) in the wart-like prominences, scattered over the surface of the frond.

Habitat. Our coasts generally. On rocks between tide-marks. Common.

Fig. 61. ELACHISTA FUCICOLA.

Colour. Olive; or rusty brown.

Substance. Soft; membranaceous.

Character of Frond. A small, very dense tuft (rising from a tubercle), parasitic on *Fucus vesiculosus*. Threads (*filaments*) of the tuft, simple; tapering to the tips; jointed.

Measurement. About an inch long when full-grown.

Fructification. Minute seeds (*spores*) concealed in the substance of the tubercle.

Habitat. Our coasts generally. On *Fucus vesiculosus*. Very common.

Fig. 62. ELACHISTA FLACCIDA.

Colour. Dull olive-brown.

Substance. Soft ; membranaceous.

Character of Frond. A small, dense tuft (rising from a tubercle) ; parasitic on *Cystoseira fibrosa*. Threads of the tuft simple ; tapering to the base ; jointed.

Measurement. Half an inch long.

Fructification. Minute seeds (*spores*) concealed in the substance of the tubercle.

Habitat. Our coasts generally. On *Cystoseira fibrosa*, common.

Fig. 63. ELACHISTA CURTA.

Colour. Pale olive.

Substance. Rather rigid.

Character of Frond. Very minute tufts (rising from a tubercle) ; parasitic on *Fuci*. Threads (*filaments*) of the tuft very short ; tapering to the base ; jointed.

Measurement. From $\frac{1}{12}$ to $\frac{1}{4}$ of an inch long.

Fructification. Minute seeds (*spores*) concealed in the substance of the tubercle.

Habitat. Swansea. On *Fuci*, between tide-marks.

A plant which has not been found for many years; and the re-finding of which would well reward the trouble of search.

Fig. 64. ELACHISTA STELLULATA.

Colour. Olive-brown.

Substance. Soft ; membranaceous.

Character of Frond. Extremely minute, starry tufts (rising from a tubercle) ; parasitic on *Dictyota dichotoma*. Threads (*filaments*) of the tuft short ; tapering to the base, thickening upwards to a blunt point (*clavate*) ; jointed.

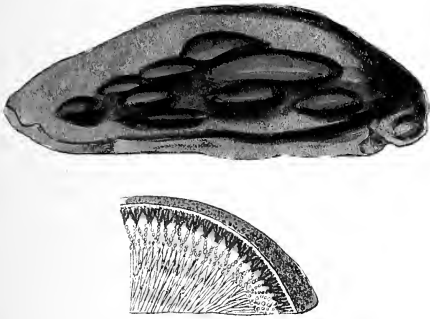
Measurement. About $\frac{1}{24}$ of an inch in diameter.

Fructification. Probably like that of the other *Elachistas*. Dr. Harvey has not yet found it.

Habitat. Torquay. On the fronds of *Dictyota dichotoma*.

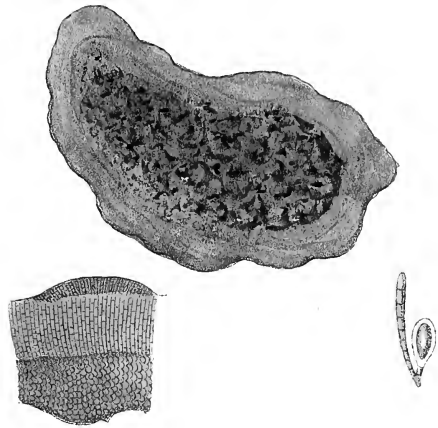
It is not known that any one has met with this alga since Mrs. Griffiths discovered it at Torquay a few years ago. Unless closely examined under the microscope, it may be mistaken for the fruit of *Dictyota dichotoma*. Dr. Harvey describes the tufts as resembling "minute stars, or Echini." It well deserves further search.

59



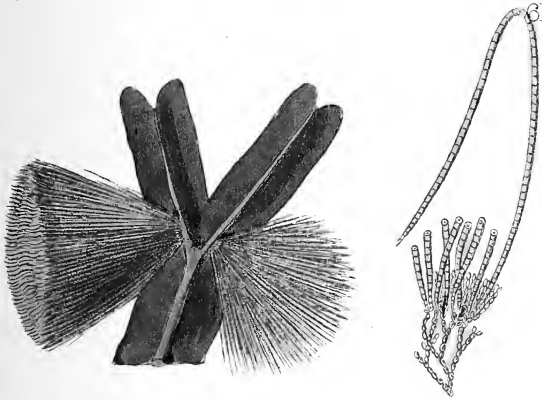
Leathesia Berkeleyi, Harv.

60



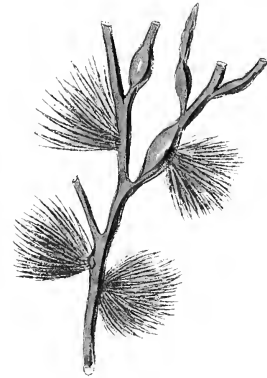
Ralfsia verrucosa, Aresch.

61



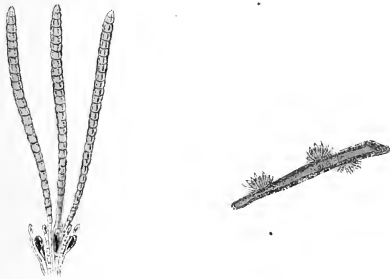
Elachista fucicola, Fries.

62



Elachista flaccida, Aresch.

63



Elachista curta, Aresch.

64



Elachista stellulata, Griff.



PLATE XVI.

Fig. 65. ELACHISTA SCUTULATA.

Colour. Dark brown.

Substance. Soft ; slippery feeling.

Character of Frond. Dark, oblong, convex patches, densely clothed with very short threads (*filaments*); parasitic on the receptacle thongs of *Himanthalia lorea*. Filaments jointed.

Measurement. Patches, $\frac{1}{2}$ an inch or more in length. Filaments, $\frac{1}{4}$ to $\frac{1}{3}$ inch long.

Fructification. Minute seeds (*spores*) concealed in the substance of the tubercle.

Habitat. Our coasts generally. On *Himanthalia lorea*.

These tubercles are formed of densely packed, branching fibres, whence issue filaments. They surround the *Himanthalia* thongs, like dark warts; sometimes completely covering them for the space of several inches; very slippery to the touch.

Fig. 66. ELACHISTA PULVINATA.

Colour. Olive.

Substance. Rather rigid.

Character of Frond. Very minute globose tufts (rising from a tubercle); parasitic on the fruiting branches of *Cystoseira ericoides*. Threads (*filaments*) of the tufts very short; tapering greatly to both ends; jointed.

Measurement. About $\frac{1}{12}$ of an inch in diameter.

Fructification. Minute seeds (*spores*) at the base of the threads.

Habitat. South of England. West of Ireland. On *Cystoseira ericoides*.

A beautiful microscopic object, says Dr. Harvey. The plant it infests looks under a common lens as if spotted with minute hairy warts. It was first found by Kützing.

Fig. 67. ELACHISTA VELUTINA.

Colour. Pale olive.

Substance. Soft; velvety.

Character of Frond. Thin, irregular patches, clothed with very short threads (*filaments*); parasitic on the receptacle-thongs of *Himanthalia lorea*, and some say of *Fucus serratus*. Filaments very minute, one thickness throughout; jointed.

Measurement. Patches, $\frac{1}{2}$ an inch or more in extent. Filaments, $\frac{1}{12}$ to $\frac{1}{10}$ inch long.

Fructification. Minute seeds (*spores*) stalked; at the base of the filaments.

Habitat. Our shores generally. On *Himanthalia lorea*.

Difficult to distinguish from *E. scutulata* (with which it is often found) except by the form of the spores which require microscopic examination. Nevertheless, the thin, velvety layer of this, and the wart-like prominence of the other, are always marks of distinction.

Fig. 68. MYRIONEMA STRANGULANS.

Colour. Dark-brown.

Character of Frond. Minute ; parasitic ; forming a small, convex, dark-brown, dot-like patch on a flat frond ; a ring-like collar round a filiform one. Filaments jointed.

Measurement. A dot or an encircling patch, varying in extent. Filaments excessively short.

Fructification. Minute seeds (*spores*) nestling among the threads (*filaments*) of the frond.

Habitat. Our coasts generally. On *Ulva* and *Enteromorpha*.

The dark-brown specks and bands formed by this plant on the green fronds of *Ulva*, &c. may easily be mistaken for symptoms of decay, if not carefully examined. They consist of numerous short, upright, jointed threads, springing from a thin expansion composed of decumbent ones. But it requires a microscope and skill to find all this out. The general appearance is soon learnt.

Fig. 69. MYRIONEMA LECLANCHERII.

Colour. Olive.

Character of Frond. Minute ; parasitic ; forming round, flat, olive-coloured patches on the fronds of *Rhodymenia palmata* and *Ulva latissima*, making them look as if spotted with decay. Filaments jointed.

Measurement. The patches sometimes extend to $\frac{1}{4}$ of an inch of diameter. Filaments excessively short.

Fructification. Minute seeds (*spores*) nestling among the threads (*filaments*) of the frond.

Habitat. Our shores generally. On *Rhodymenia palmata* ; and on *Ulva latissima*, in deep water.

Thinner and lighter coloured than *M. strangulans*, and spreading in much larger patches.

Fig. 70. MYRIONEMA PUNCTIFORME.

Colour. Dark-olive.

Character of Frond. Minute ; parasitic ; convex ; forming globose dots on *Ceramium rubrum*, &c.

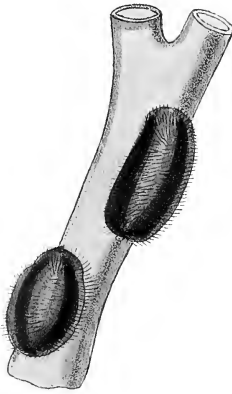
Measurement. A dot!

Fructification. Minute seeds (*spores*) among the threads (*filaments*) of the frond.

Habitat. Our coasts generally. On several red sea-weeds.

Easily mistaken for little bits of dirt, unless examined. For another *Myrionema*, see Plate XVIII. Fig. 75.

65.



Elachista scutulata, Duby.

66.



Elachista pulvinata, Harv.

67.



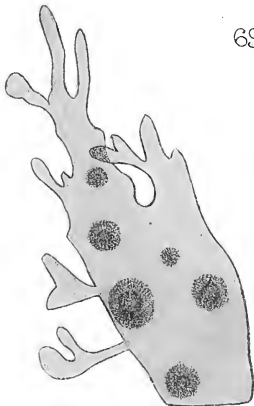
Elachista velutina, Fries.

68.



Myrionema strangulans, Grv.

69.



Myrionema Leclancherii, Harv.

70.



Myrionema punctiforme, Harv.

PLATE XVII.

Fig. 71. CLADOSTEPHUS SPONGIOSUS.

Colour. Dull-brown or dirty olive-green.

Substance. Rigid; rough; spongy.

Character of Frond. A clumsy little bush. Branches thick, obtuse, cylindrical; irregularly forked (*dichotomous*). Densely (but irregularly) clothed with short branchlets, so thickly crowded that they overlap each other. Branchlets jointed; falling off in winter.

Measurement. From 3 to 4 inches long.

Fructification. Oval seeds (*spores*); stalked; borne on a special set of minute branchlets which grow irregularly over the branches when the summer set dies off.

Habitat. Our coasts generally. On rocks and stones between tide-marks. Common.

Known from *C. verticillatus*, by the irregular distribution of the summer branchlets; contrasting unfavourably with the orderly frills (*whorls*) of them at regular distances in *C. verticillatus*. For *C. verticillatus* refer back to Plate XIV. Fig. 58.

Fig. 72. SPHACELARIA FILICINA.

Colour. A beautiful green-olive.

Substance. Firm, somewhat rigid, but delicate.

Character of Frond. Delicately bushy. Stem and branches jointed throughout; thread-like (*filiform*). Stem shaggy at base; slender; irregularly branched; often bearing at the top several branches displayed like a fan. Branches alternate. Branches and branchlets twice branched; lanceolate in outline; all the angles of branching acute.

Measurement. From 2 to 4 inches long.

Fructification. Oval seeds (*spores*) borne on the branchlets in winter.

Habitat. South of England and Ireland; Jersey. Very rare.

No description can do justice to this beautifully delicate little plant. Were it the handwork of man, we should exclaim at the exquisite skill betrayed by its elaborately worked-out and tasteful construction. This species, like all its relatives (*congeners*), is subject to what is considered a *withering* of the tips of the branchlets, which become partially colourless, partially filled with a dark substance, the nature of which is not known.

Fig. 73. SPHACELARIA SCOPARIA.

Colour. Olive-green when young ; when old, rusty and dark-brown.

Substance. Rigid ; robust.

Character of Frond. Bushy. Stem and branches jointed throughout ; thread-like (*filiform*). Stem shaggy at base ; robust ; irregularly branched ; the main divisions spreading at their summit into dense tufts of branchlets. Branches alternate ; re-branched twice or even three times.

Measurement. From 2 to 4 inches long.

Fructification. Globose seeds (*spores*) borne on the branchlets in winter.

Habitat. Southern coasts of England, common. Frith of Forth. Irish coast in several places, but not common.

This plant is prettiest in winter, when so many of its crowded branches have died off, that it looks a much more suitable brother of *S. filicina* than in its shaggy summer state.

Fig. 74. SPHACELARIA PLUMOSA.

Colour. Olive-green.

Substance. Rigid, but delicate.

Character of Frond. Delicately bushy. Stem and branches partially jointed ; thread-like (*filiform*). Stem not jointed ; many from one base ; smooth, longish, irregularly branched. Branches exactly opposite ; re-branched with short simple branchlets, like a feather (*pinnate*) ; tufted or scattered ; from $\frac{1}{2}$ to $1\frac{1}{2}$ inch long ; resembling feathers.

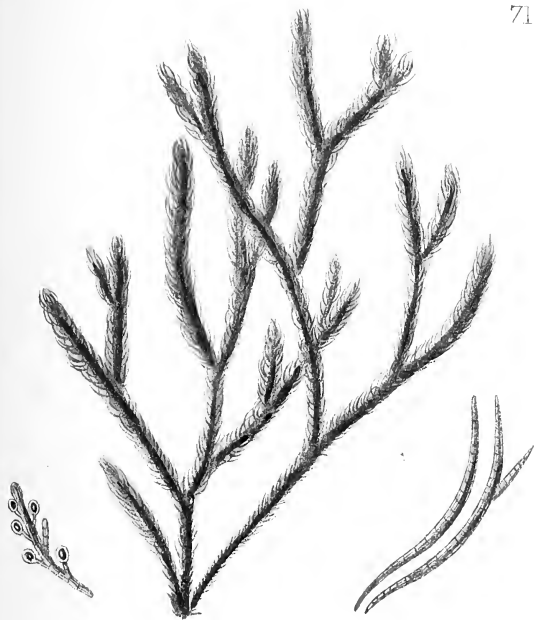
Measurement. From 2 to 6 inches long.

Fructification. Oval seeds (*spores*) borne on the branches in winter.

Habitat. Several places from Orkney to the Land's End ; but much more luxuriant in the north, and nowhere common.

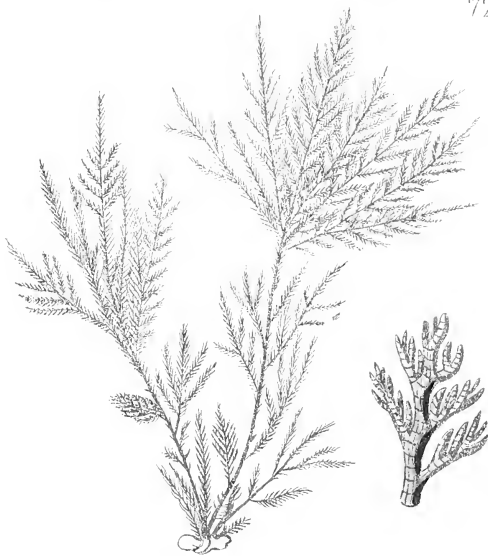
The branching is so irregular that specimens have often quite a ragged appearance. But it is a beautiful plant, and the resemblance to a tuft of feathers is striking.

71.



Cladostephus spongiosus, Ag.

72.



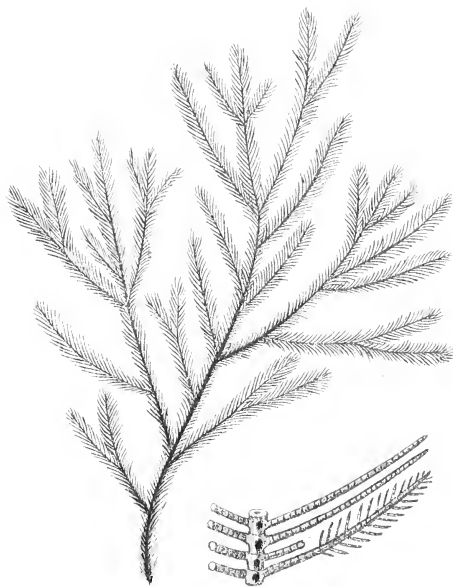
Sphacelaria Eihoma, Ag.

73.



Sphacelaria scoparia, Lyngb.

74.



Sphacelaria plumosa, Lyngb.



PLATE XVIII.

Fig. 75. MYRIONEMA CLAVATUM.

Colour. "Nearly the colour," says Captain Carmichael, "of the then purplish crust on which it grows."

Character of Frond. "Very minute; rather convex," the threads (*filaments*) of which it is composed, club-like ("*clavate*"); mostly cleft in two ("*bifid*").

Measurement. The description does not specify.

Fructification. Minute seeds (*spores*) affixed to the filaments.

Habitat. Not defined.

Nothing is known of this plant beyond Captain Carmichael's description and figure, and the account is very imperfect. For the other *Myrionemas*, refer back to Plate XVI. Figs. 68, 69, 70.

Fig. 76. SPHACELARIA SERTULARIA.

Colour. Olive-green.

Substance. Rigid; but delicate.

Character of Frond. Delicately bushy. Stem and branches jointed throughout; thread-like (*filiform*). Stem slightly shaggy at base; weak and slender; irregularly branched. Branches alternate; spreading horizontally; two or three times re-branched. Angles of branching very wide.

Measurement. Scarcely 3 inches long.

Fructification. Oval seeds (*spores*) borne on the branchlets.

Habitat. From deep water. South of England, and North and West of Ireland. Very rare.

A smaller and slenderer plant than *S. filicina*, but Dr. Harvey hesitates about making two species of them. *S. filicina* has, however, all its angles of branching very acute and narrow; while those of *S. sertularia* are very obtuse and wide; the branching of *S. filicina* is therefore erect, that of *S. sertularia* spreading.

Fig. 77. SPHACELARIA CIRRHOSA.

Colour. Dark-brown; or rusty.

Substance. Rigid; yet not coarse.

Character of Frond. A star-like tuft, more or less dense, growing on the stems of other algæ. Jointed throughout; thread-like (*filiform*); assuming many forms. Each thread (*filament*) of the tuft, branched with short, often (but not always) opposite branchlets. There are many deviations, and the branching is more or less complicated, but *S. cirrhosa* is always a *tuft*.

Measurement. An inch or more long; often less.

Fructification. Globose seeds (*spores*) borne on the branchlets.

Habitat. Our coasts everywhere. On *Halidrys siliquosa* abundant; and common on numerous other plants.

A very dwarf variety has been observed by Miss Cutler, on the stems of *Desmarestia aculeata*.

Fig. 78. SPHACELARIA FUSCA.

Colour. Brown.

Substance. Rigid ; but not coarse.

Character of Frond. A tuft ; jointed throughout ; thread-like (*filiform*). Branches long and simple, bearing a few short, occasionally *three-armed (trifid)* branchlets. (See Plate.)

Measurement. From 3 to 5 inches long.

Fructification. Globose seeds (*spores*) borne on the branchlets.

Habitat. Shores of Wales ; Sidmouth ; St. Michael's Mount, Cornwall.

Fig. 79. SPHACELARIA RADICANS.

Colour. Dull greenish-olive.

Substance. Rigid ; harsh.

Character of Frond. Very short tufts spreading in patches on rocks. Tufts composed of jointed threads (*filaments*) slightly branched ; sometimes upright, sometimes lying flat ; sending out little fibrous roots from their lower side.

Measurement. From $\frac{1}{2}$ an inch to an inch high.

Fructification. Globose seeds (*spores*) borne on the branchlets ; clustered ; abundant.

Habitat. Various parts of Great Britain and Ireland. On sand-covered rocks between tide-marks. Not uncommon.

Often overlooked from its insignificance.

Fig. 80. SPHACELARIA RACEMOSA.

Colour. Olive.

Substance. Rigid ; hard.

Character of Frond. Short tufts, growing on rocks. Tufts composed of jointed threads (*filaments*) branched in a forked manner (*dichotomously*).

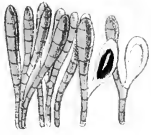
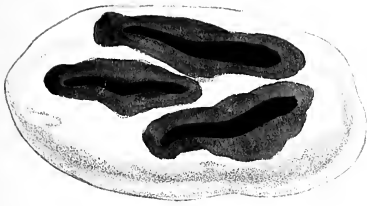
Measurement. An inch high.

Fructification. Egg-shaped seeds (*spores*) on stalks ; in clusters ; several on a branchlet together (*racemose*).

Habitat. Friths of Forth and of Clyde. Very rare.

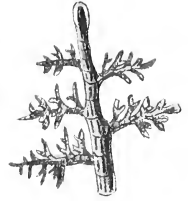
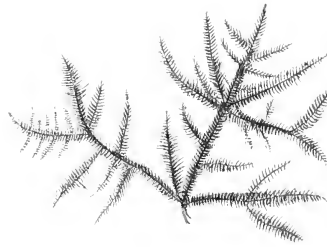
The grape-like fructification being very plentiful, there is no difficulty in recognising this plant when in fruit. It is allied to *S. radicans*, but is larger.

75.



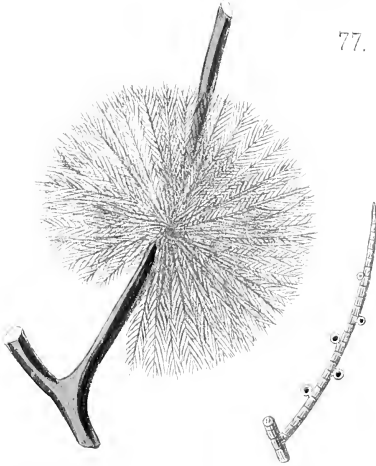
Myriophema clavatum, *Carv.*

76.



Sphaclaria Sertularia, *Bourm.*

77.



Sphaclama cirrhosa, *Ag.*

78.



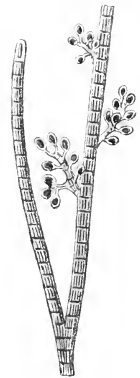
Sphaclaria fusca, *Ag.*

79.



Sphaclaria radicans, *Harv.*

80.



Sphaclama racemosa, *Harv.*

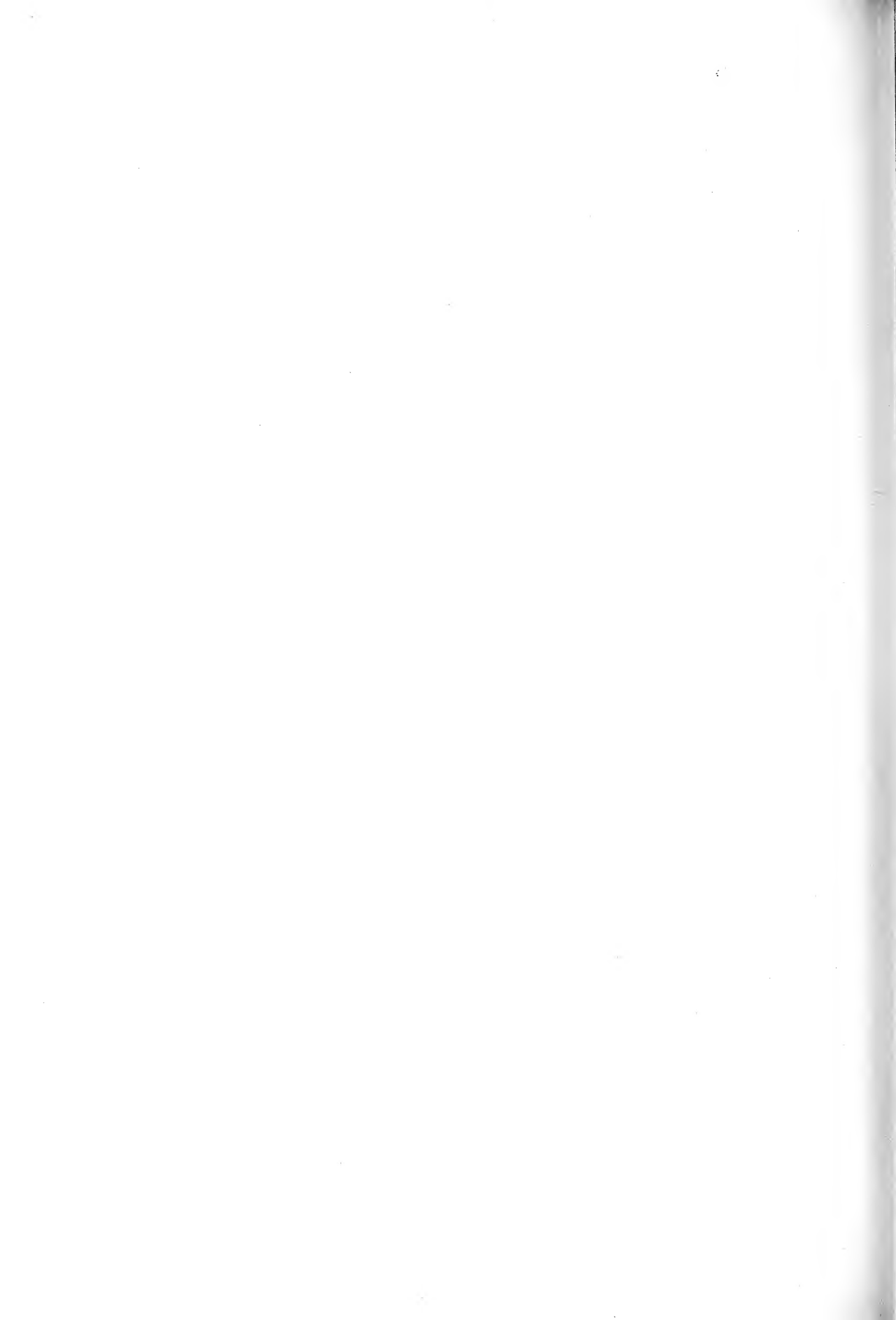


PLATE XIX.

Fig. 81. ECTOCARPUS SILICULOSUS.

Colour. Yellowish, or a pleasant olive-green; occasionally green; sometimes rusty-brown.

Substance. Somewhat gelatinous; soft; silky.

Character of Frond. Long tufts of very slender, jointed threads (*filaments*). Filaments excessively branched. Branches irregularly set, and of various lengths; bearing a second and third set of many-times-divided branchlets; the last ones sometimes only on one side (*secund*).

Measurement. From 6 to 18 inches long.

Fructification. In pod-like formations (*silicules*); external; borne on the branches. Silicules awl-shaped; more or less finely pointed; marked with lines across (*transversely striate*); stalked.

Habitat. All round our coasts. On algæ between tide-marks. Very common.

When dried young this species has a gloss upon it. A variety, in which the *silicules* have longer stalks than usual, has been called *longipes*.

Fig. 82. ECTOCARPUS FASCICULATUS.

Colour. Varying from olive-green to brown.

Substance. Soft; but not so delicate as *E. siliculosus*.

Character of Frond. Dense tufts of jointed threads (*filaments*). Filaments branched, though not excessively. Branches distant; bearing throughout, short bundles of branchlets (*fascicles*), many times divided.

Measurement. From 1 to 3 inches long.

Fructification. In pod-like formations (*silicules*); external; borne on the branchlets. Silicules egg-shaped (*ovate*); with a more or less blunt point; marked with lines across (*transversely striate*); unstalked (*sessile*); often several close together on one side the branchlet (*secund*).

Habitat. Our coasts generally. On the larger algæ. Not uncommon.

The finely drawn out point of the silicule, here figured, is very rarely, if ever, met with. The silicules vary much in comparative width and length, but there is a tendency to bluntness at the tip, even when most drawn out.

Fig. 83. ECTOCARPUS HINCKSLÆ.

Colour. Dark-olive.

Substance. Rather harsh for an *Ectocarpus*; (like *E. littoralis*.)

Character of Frond. Slender tufts of jointed threads (*filaments*). Filaments irregularly and rather distantly branched. Upper part of branches furnished on one side with slightly curved branchlets. Branchlets furnished on their inner faces in a similar manner, so as to resemble little combs.

Measurement. From 1 to 2 inches long.

Fructification. In pod-like formations (*silicules*); external; borne on the inner faces of the last branchlets. Silicules conical. Set like buttons, one upon each joint. (See figure of the magnified branch.)

Habitat. Our coasts generally. Usually parasitical on *Laminaria bulbosa*. Filey. Not common.

The repeated *secund* branching (branches on one side the stem only) of this plant distinguishes it from all others. Several, it is true, have their ultimate branches branched *secundly*; but in no other case is the growth repeated so as to make the branchlets resemble little combs. *E. Hincksia* is sometimes found in company with *E. siliculosus*, but its darker tint and less glossy appearance prevent any confusion between the two.

Fig. 84. ECTOCARPUS TOMENTOSUS.

Colour. Sometimes a pleasant olive-green; oftener a dull brown; occasionally rust-colour.

Substance. Soft; spongy.

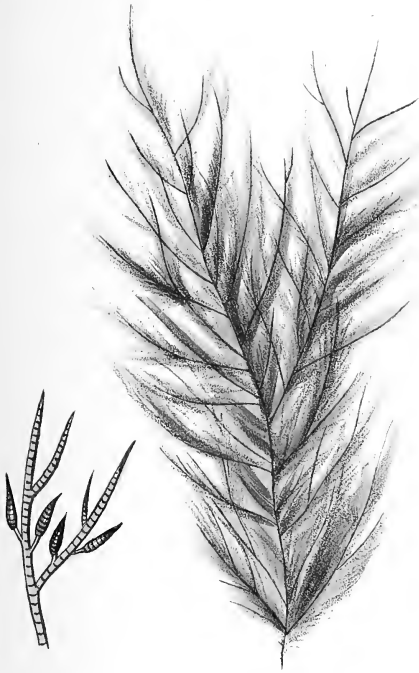
Character of Frond. Very fine, jointed threads (*filaments*) inextricably woven together into rope-like branches. Branching of the filaments irregular; chiefly alternate, on each side a stem. In some specimens the filaments being less matted than usual, the ends and sides are free, and the plant has a soft, feathery appearance.

Measurement. From 1 to 8 inches long.

Fructification. In pod-like formations (*silicules*); external; borne on the branchlets. Silicules stalked; narrow-oblong; blunt at the points.

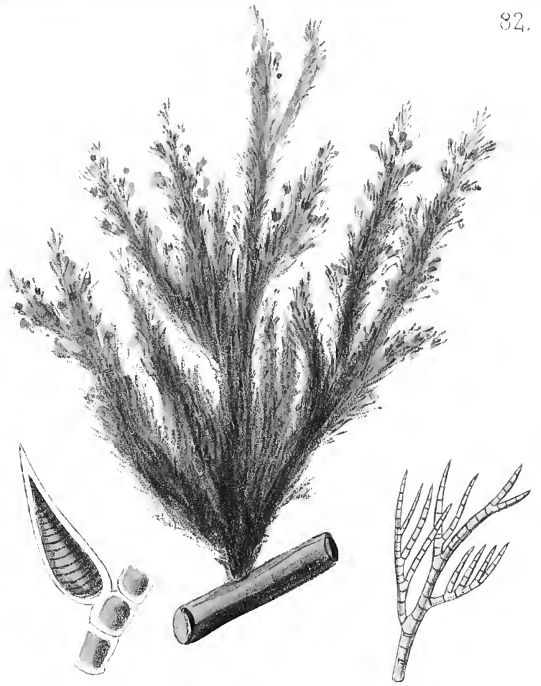
Less matted forms of this plant bear some resemblance to very dense tufts of *E. siliculosus*; but they are always duller-looking. And there is generally *some* portion of each specimen, sufficiently matted and rope-like, to stamp the character of the species.

81.



Ectocarpus siliiculosus, Lyngb.

82.



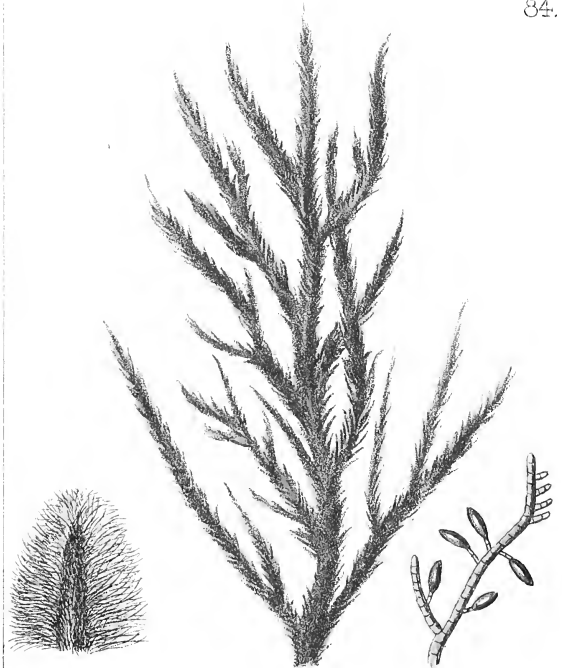
Ectocarpus fasciculatus, Harv.

83.



Ectocarpus Hincksiae, Harv.

84.



Ectocarpus tomentosus, Lyngb.

PLATE XX.

Fig. 85. ECTOCARPUS AMPHIBIUS.

Colour. Pale-olive.

Substance. Soft.

Character of Frond. Short tufts of very slender, jointed threads (*filaments*). Filaments branched. Branching partly-forked (*subdichotomous*); the ultimate branchlets alternate, on each side a stem.

Measurement. From 2 to 3 inches long.

Fructification. In pod-like formations (*silicules*); external; borne on the branchlets. Silicules scattered; without stalks (*sessile*); long; narrow; almost spine-like.

Habitat. In muddy ditches of brackish water near the coast.

Dr. Harvey considers it possible that this may be but a brackish-water variety of *E. siliculosus*.

Fig. 86. ECTOCARPUS FENESTRATUS.

Colour. Pale-green.

Substance. Soft.

Character of Frond. Small tufts of jointed threads (*filaments*). Filaments branched, but not much so. Branches distant; alternate, on each side a stem; re-branched with a few long, simple, alternate branchlets.

Measurement. From 1 to 2 inches long.

Fructification. In pod-like formations (*silicules*); external; scattered plentifully along the branchlets. Silicules dark-brown; narrow-oblong; stalked; densely marked with lines across (*transversely striate*), and cross-barred.

Habitat. Salcombe. (Mrs. Wyatt, once!)

This plant should be looked for further. The shape of its *silicules* distinguishes it from *E. siliculosus*, and its general character of growth from *E. tomentosus*.

Fig. 87. ECTOCARPUS DISTORTUS.

Colour. Dark-brown.

Substance. Soft; tender; soon decomposing; extremely brittle if remoistened after being dried.

Character of Frond. Large, densely matted tufts of jointed threads (*filaments*). Filaments very much branched; bent here and there in a zigzag manner, as if distorted. Branches long; spreading at wide angles; beset with short, thorn-like, but blunt branchlets; either wide-spread (*patent*); horizontal; or bent backward (*re-curved*).

Measurement. Tufts from 4 to 8 inches long.

Fructification. External seeds (*spores*) borne on the branches; more or less oval; dark-brown; unstalked (*sessile*), or but slightly stalked.

Habitat. Appin. On the shore. Parasitic on *Zostera marina*. Rare.

Fig. 88. ECTOCARPUS LANDSBURGII.

Colour. Dark-brown.

Substance. Rigid; tough; re-moistening without injury.

Character of Frond. Densely matted tufts of jointed threads (*filaments*). Filaments much branched; zigzag. Branches irregularly forked; everywhere bristling with quantities of short, straight, horizontal, thorn-like branchlets.

Measurement. Tufts from 1 to 3 inches long.

Fructification. Unknown. Probably similar to that of *E. distortus*.

Habitat. Scotland and Ireland. Lamlash, Dr. Landsborough. Roundstone Bay, Dr. Harvey. Dredged in deep water in land-locked bays. Rare.

This and the preceding species resemble each other much in general appearance and colour. But *E. Landsburgii* is more profusely and more distinctly thorny, the tips of its branchlets being pointed; its filaments are more densely opaque, and its substance is much firmer. It is only obtained by dredging; and the tufts are never so large as those of *E. distortus*.

Fig. 89. ECTOCARPUS SPHÆROPHORUS.

Colour. Dull olive-green or rusty-brown.

Substance. Soft; moderately firm.

Character of Frond. Full bushy tufts of jointed threads (*filaments*). Filaments much branched; slender; straight. Main stems somewhat matted; branches free, repeatedly divided. Upper ones either opposite or in fours (*quaternate*).

Measurement. From 1 to 3 inches long.

Fructification. External seeds (*spores*) borne on the branchlets; either opposite to each other on opposite sides of the stem, or opposite to a branchlet; occasionally in fours; unstalked (*sessile*); globose; prominent.

Habitat. Various places on our coasts, from Orkney to Cornwall. (Filey.) Between tide-marks. Parasitical on the smaller algæ; chiefly on *Ptilota sericea*. Rare.

Fig. 90. ECTOCARPUS BRACHIATUS.

Colour. Pale olive-green; occasionally tawny.

Substance. Very soft; delicate.

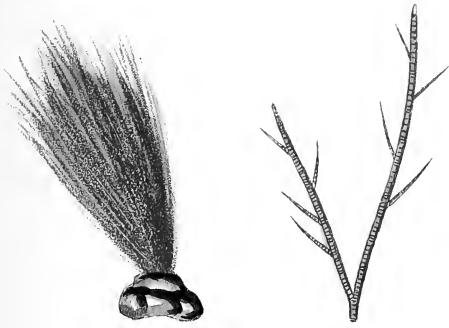
Character of Frond. Feathery tufts of jointed threads (*filaments*). Filaments excessively branched; slender; wavy. Main stems slightly entangled; branches and branchlets free; all exactly opposite to each other on each side a stem; or occasionally in fours (*quaternate*).

Measurement. From 2 to 4 inches long.

Fructification. Seeds (*spores*) imbedded in the filaments borne on the lesser branchlets; or in the angles where two branchlets meet; forming oblong swellings.

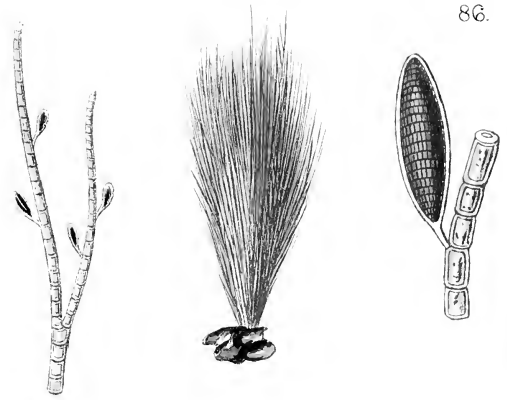
Habitat. England and Ireland. Parasitic on *Rhodymenia palmata* in the sea; found with *Enteromorpha compressa* in ditches of brackish water. Rare.

85.



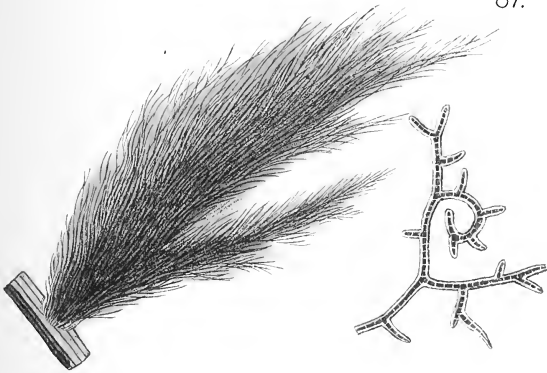
Ectocarpus amphibius, Harv.

86.



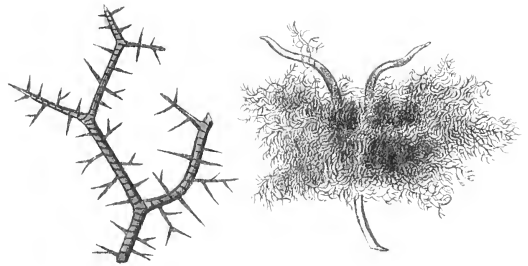
Ectocarpus fenestratus, Berk.

87.



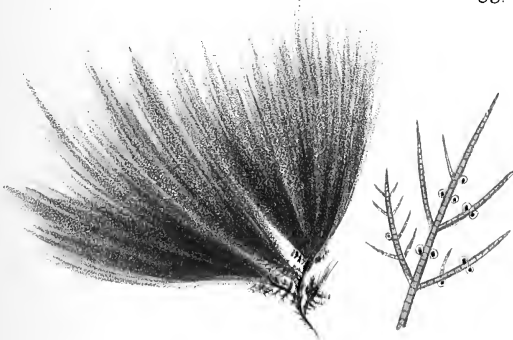
Ectocarpus distortus, Carn.

88.



Ectocarpus Landsburgii, Harv.

89.



Ectocarpus sphaerophorus, Carn.

90.



Ectocarpus brachiatus Harv.

PLATE XXI.

Fig. 91. ECTOCARPUS CRINITUS.

Colour. When fresh, "bright bay;" when dried, a dull but rather pleasant green, with a slight gloss.

Substance. Moderately firm.

Character of Frond. Tufts of jointed threads (*filaments*) lying on the mud in extensive fleecy strata. Filaments slightly and distantly branched. Branches long; nearly simple.

Measurement. Filaments about 2 inches long.

Fructification. External seeds (*spores*) borne on the branches. Spores globose; scattered; unstalked (*sessile*). Rarely found.

Habitat. Appin. Capt. Carmichael. Watermouth, Devonshire, Mrs. Griffiths. On muddy sea-shores. Rare.

Fig. 92. ECTOCARPUS PUSILLUS.

Colour. Pale brown; sometimes drying rather greener.

Substance. Soft; delicate.

Character of Frond. Tufts of jointed threads (*filaments*); "like pale brown wool." Filaments simple, or slightly and distantly branched; interwoven.

Measurement. About an inch long.

Fructification. External seeds (*spores*) borne on the filaments. Spores roundish oblong; often two or three together; plentifully scattered.

Habitat. South coast of England. Parasitical on several of the smaller algæ. Rare.

"A connecting link between the simpler and more branching species. . . . Almost always found with fruit."—HARVEY.

Fig. 93. ECTOCARPUS LITTORALIS.

Colour. Olive-brown, or olive-green ; not unfrequently rust-coloured.

Substance. Soft, though coarse, when young ; rigid when old.

Character of Frond. Dense, interwoven tufts of jointed threads (*filaments*). Filaments harsh when old ; much and irregularly branched. Main stems often entangled ; the lesser divisions free. Branches alternate, on each side a stem ; branchlets often opposite.

Measurement. From 6 to 12 inches long.

Fructification. Formed in the substance of the branchlets ; a portion of which becomes converted into fruit-bearing, pod-like formations (*silicules*), causing dark oblong swellings ; the tips of the branchlet appearing beyond. (See figure.)

Habitat. All round our coasts. Parasitical on the larger algæ, &c. Between tide-marks. Very common.

Fig. 94. ECTOCARPUS LONGIFRUCTUS.

Colour. Olive-green.

Substance. Soft, though coarse.

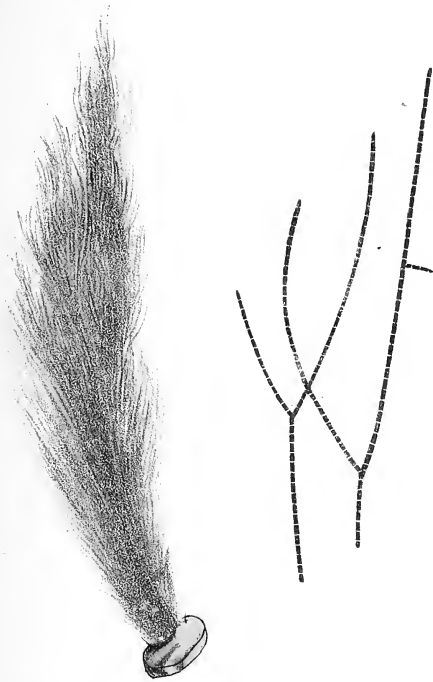
Character of Frond. Large tufts of jointed threads (*filaments*). Filaments robust ; excessively branched. Branches mostly opposite ; the lesser ones set with short, thorn-like, opposite (rarely, alternate) branchlets.

Measurement. Six inches long.

Fructification. Formed in the substance of the branchlets ; a portion of which becomes converted into fruit-bearing, pod-like formations (*silicules*), causing dark, oblong swellings, extending to the tips. (See figure.)

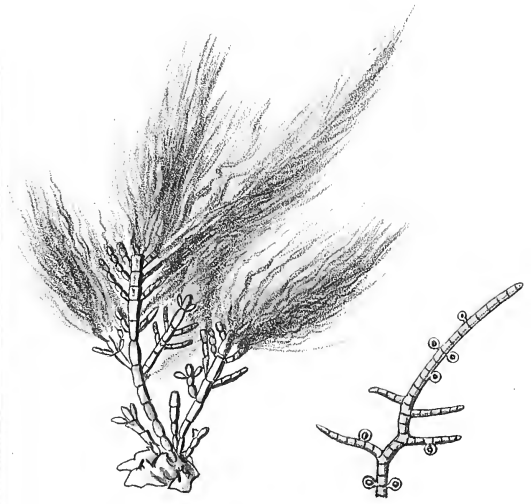
Habitat. Orkney. Parasitical on algæ between tide-marks. Rare.

91.



Ectocarpus crinitus, Carm

92.



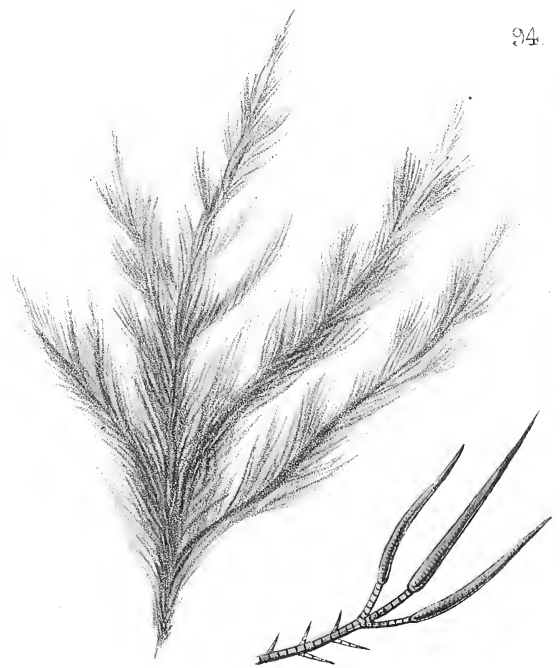
Ectocarpus pusillus, Griff

93.



Ectocarpus litoralis, Lyngb.

94.



Ectocarpus longifolius, Horn



PLATE XXII.

Fig. 95. ECTOCARPUS GRANULOSUS.

Colour. Green in youth ; afterwards olive-green or yellowish.

Substance. Moderately firm ; soft.

Character of Frond. Feathery tufts of jointed threads (*filaments*). Filaments much branched. Branches on each side stems ; sometimes opposite, sometimes alternate ; extreme branchlets often set, four or five in succession on one side (*secund*). Main divisions slightly entangled ; lesser ones quite free and feathery.

Measurement. From 1 inch to a foot long. (Dependent on the depth of water.)

Fructification. External seeds (*spores*) borne on the branchlets. Spores large ; oval ; dark-brown ; marked with lines across (*transversely striate*) ; minutely crossbarred ; unstalked (*sessile*) ; abundant.

Habitat. Our shores generally. On rocks or algæ between tide-marks. Frequent.

The figure of this plant is not very characteristic. Its growth is looser and freer than the representation. There are several varieties of it, one of which is now raised to the dignity of a species, *E. tessellatus*. It is a small plant, growing in crevices of the rocks at half-tide level, and is exquisitely green when young. The *tessellated* appearance of the spores gave rise to the name. One of its characters is the *secund* growth of the extreme branchlets. Another variety, chiefly found on the south coast, is less richly branched, but all, or nearly all its branches and branchlets are *opposite* on each side the stems. Intermediate forms occur with opposite and alternate branching mixed. *E. tessellatus* was first noticed on rock-crevices on the top of Filey Bridge by Mr. Hayden ; but it has been found abundantly since. Whether it has a right to a position as a species is still doubtful, but it is at any rate a very lovely variety.

Fig. 96. ECTOCARPUS MERTENSII.

Colour. A beautiful olive-green in the early part of the year, becoming browner in the summer and autumn.

Substance. Soft and delicate.

Character of Frond. Tufts of jointed threads (*filaments*). Filaments branched in a regular and remarkable manner. Main stems simple, or nearly so ; set throughout with exactly opposite branches, of unequal length. Branches also simple ; set throughout (and closely) with slender, spreading branchlets $\frac{1}{2}$ the diameter of the branch ; except where a pair of larger branchlets takes the place of a pair of the lesser ones. Secondary branchlets similarly re-branched ; the whole plant resembling a collection of delicate feathers.

Measurement. From 2 inches to a foot in length.

Fructification. Seeds (*spores*) imbedded in the branchlets, forming dark oblong swellings. (See figure.)

Habitat. Our coasts here and there from Orkney to Cornwall, and in Ireland. On mud-covered rocks and stones, near low-water mark ; and at a greater depth.

Fig. 97. MYRIOTRICHIA CLAVÆFORMIS.

Colour. Yellowish-brown.

Substance. Very soft; limp; slightly gelatinous.

Character of Frond. Small tufts of jointed threads (*filaments*) fringing other algæ. Each filament quite simple; naked below; upwards densely clothed with branchlets, which gradually increase in length as they approach the tips; thus giving the frond a club-shaped form. Branchlets re-branched in a similar way; the second set bearing long colourless fibres from their tips.

Measurement. Half an inch long.

Fructification. External seeds (*spores*) borne on the branchlets; egg-shaped; dark; the transparent case (*perispore*) which encloses them, visible all round.

Habitat. Our coasts generally. Parasitic on *Chorda lomentaria*. Occasionally.

Fig. 98. MYRIOTRICHIA FILIFORMIS.

Colour. Yellowish-brown.

Substance. Very soft; limp; slightly gelatinous.

Character of Frond. Small tufts of jointed threads (*filaments*) fringing other algæ so naturally, that the combination has the appearance of being one plant. Filaments very slender; often curled; several twisted together into rope-like tufts. Each stem quite simple; at intervals looking as if thickened into dark knobs. Under the microscope these prove to be clusters of minute, stunted, oblong branchlets, from which issue the long colourless fibres characteristic of the genus.

Measurement. An inch or more in length.

Fructification. External seeds (*spores*) borne on the branchlets. Spores egg-shaped, dark; the transparent case (*perispore*) which encloses them, visible all round.

Habitat. Our coasts generally. Parasitic on *Chorda lomentaria*, and *Asperococcus echinatus*; at half-tide level. Abundant at Filey. Not uncommon.

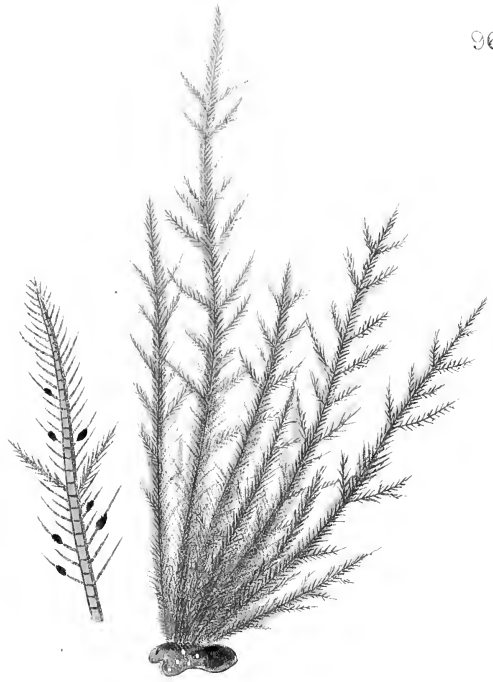
This plant is sometimes found accompanying *M. clavæformis*; but is very much more frequently met with.

95.



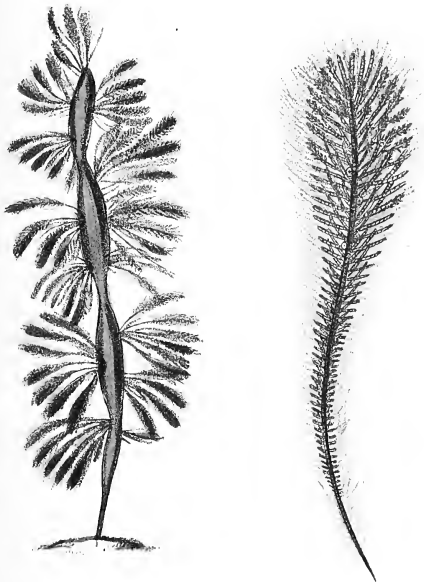
Ectocarpus granulatus, Ag.

96.



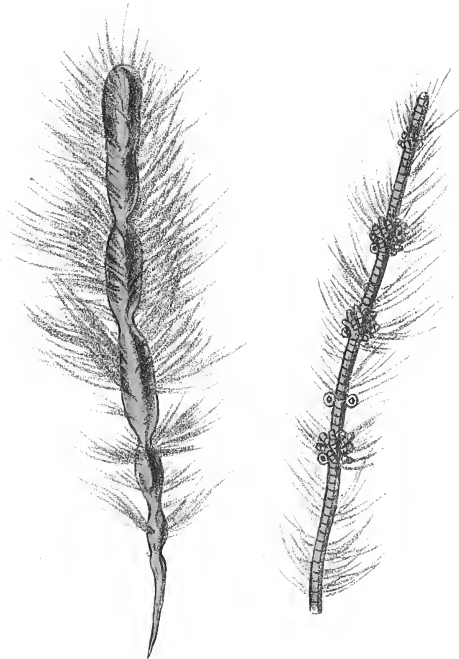
Ectocarpus Mertensii, Ag.

97.



Myriotrichia claviformis, Harv.

98.



Myriotrichia filiformis, Harv.



PLATE XXIII.

Fig. 99. ODONTHALIA DENTATA.

Colour. Deep ruby-red, when growing; soon turning darker when thrown ashore; when dried, black, except very young plants, or the new shoots of old ones, which retain a reddish-pink hue.

Substance. Membranaceous, but firm and elastic.

Character of Frond. Flat; narrow; obscurely midribbed; branched. Branching alternate; irregular. Main stem simple or forked; deeply toothed on each side. Branches issuing from the axils of the teeth; narrow at the base, widening upwards; either toothed or deeply cut into narrow branchlet-like segments (*pinnatifid*). The whole frond preserving nearly the same width throughout; and at one level, as if cut out of paper.

Measurement. From 3 to 12 inches long.

Fructification. Of two kinds; external. 1. Clusters of seeds (*spores*)* contained in ovate, transparent cases (*capsules*). 2. Seeds divided into four parts (*tetraspores*), contained in lanceolate pods (*stichidia*). Scattered along the margins on slender stalks which are either simple or branched.

Habitat. Scotland. North of England and Ireland. In pools and on rocks in the sea. Frequent.

When once seen, this plant cannot be mistaken for any other; and even a study of the figure will make it easy to recognize. It was for a long time supposed to have its southern limit in the county of Durham; but it has since been found abundantly in a deep pool in Gristhorpe Bay, between Scarborough and Filey; is common at Filey, and has been picked up as low as Flamborough Head. It is magnificent in size at the Giant's Causeway in Ireland.

* N.B. For brevity's sake the reader is requested to accept this explanation of the words *Spore*, *Tetraspore*, *Capsule*, *Stichidium*, as here given once for all. The terms will be used hereafter as a matter of course.

Fig. 100. RHODOMELA LYCOPODIOIDES.

Colour. A dark-brownish red; becoming darker in drying.

Substance. Robust and elastic; young branches soft; old ones harsh.

Character of Frond. Thread-like (*filamentous*); tufted; branched; the filaments opaque. Stems long, thread-shaped (*filiform*), simple; or divided near the base into several long, simple branches; densely clothed with slender, feathery, finely-divided branchlets. These dying partially down in winter, the stems are left bristling with their stunted remains; in which condition the plant can hardly be recognized; and in the second summer, when it has thrown out fresh branchlets, the old and new growths are found together.

Measurement. From 4 to 18 inches long.

Fructification. Of two kinds; chiefly external. 1. Clustered *spores* in ovate *capsules*; external. 2. *Tetraspores* in *stichidia*, or in swollen branchlets.

Habitat. Scotland, and the North of England and Ireland. On the stems of *Laminaria digitata*. Common.

For another *Rhodomela*, see Plate XXIV. Fig. 103.

Fig. 101. RYTIPHLÆA THUYOIDES.

Colour. A dull-brown or brownish-yellow ; becoming black in drying.

Substance. Robust and elastic.

Character of Frond. Thread-like (*filamentous*) ; tufted ; branched ; the filaments opaque, closely marked with lines across (*transversely striate*). Stems thread-shaped (*filiform*) ; erect ; rising from creeping fibres ; below, naked ; or set with short spine-like branchlets ; above, much branched ; branches close, very erect, many times re-branched, but shortly, so as always to preserve a narrow lanceolate outline.

Measurement. From 3 to 4 inches long.

Fructification. Of two kinds. 1. Clusters of *spores* in ovate *capsules* ; external. 2. *Tetraspores* in distorted swollen branchlets.

Habitat. Our coasts generally. In tide-pools, frequent ; but not on the N. East coast.

Fig. 102. RYTIPHLÆA FRUTICULOSA.

Colour. Dull reddish, or yellowish-brown.

Substance. Robust and elastic.

Character of Frond. Thread-like (*filamentous*) ; tufted ; branched ; the filaments opaque, closely marked with lines across (*transversely striate*). Stems forked (spreading widely) from the base ; branches the same, partly forked (*dichotomous*), partly branched like a feather (*pinnate*). Angles of the branches (*axils*) rounded. Branchlets alternate ; horizontal ; short ; so that each branch has a narrowish outline.

Measurement. From 3 to 6 inches long.

Fructification. Of two kinds. 1. Clusters of *spores* in ovate *capsules* ; external (very rare). 2. *Tetraspores* in swollen branchlets (common).

Habitat. Our coasts generally. On sand-covered rocks between tide-marks. Common.

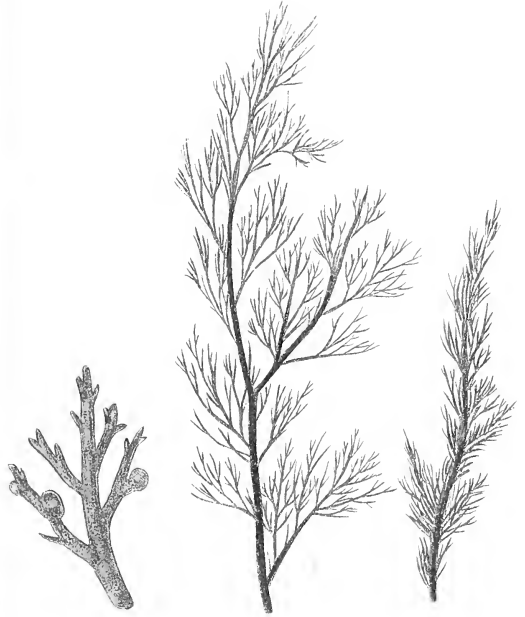
For the other *Rytiphlæas*, see Plate XXIV. Fig. 104 ; and Plate XXV. Fig. 108.

99



Odonthalia dentata, Lynob.

100



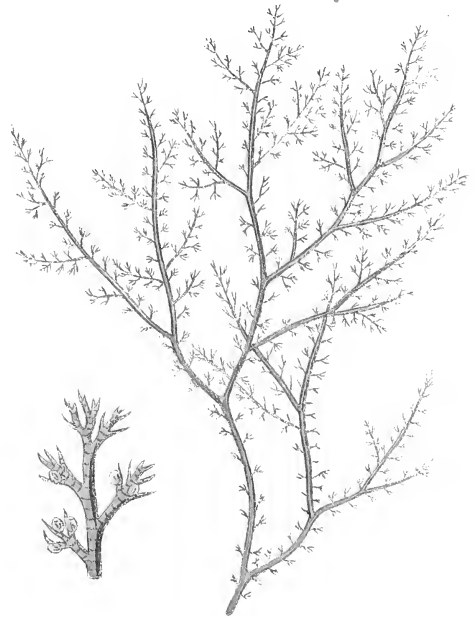
Rhodomela lycopodioides, Ag

101



Ectophleba thuyoides, Harv

102



Ectophleba fruticulosa, Harv



PLATE XXIV.

Fig. 103. RHODOMELA SUBFUSCA.

Colour. Dark brownish-red ; becoming nearly black in drying.

Substance. Rigid.

Character of Frond. Thread-like (*filamentous*) ; tufted ; bushy ; much branched ; in summer everywhere clothed with minute branchlets. Filaments opaque ; becoming finer upwards. Stems simple or divided ; branches long, straight, simple ; set with simple or re-branched branchlets, which are alternate and often crowded together above ; sometimes feathery from subdivision. In winter the finer branchlets die partially down, leaving the stems irregularly clothed with stunted remains. In the following spring a fresh set arise, and on these the fructification is often produced.

Measurement. From 4 to 10 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate *capsules* ; external. 2. *Tetra-spores* immersed in the ends of swollen branchlets ; solitary or in pairs. The black tubercles which are sometimes found on this plant are a diseased growth—not fructification.

Habitat. All round our coasts. On rocks and algæ between tide-marks. Common.

For the other *Rhodomela*, see Plate XXIII. Fig. 100. In characteristic specimens the two species are unlike enough ; but intermediate varieties sometimes occur. *R. lycopodioides* is, however, a strictly north-country plant. There is a great resemblance between this genus and the next two (*Rytiphlaea* and *Polysiphonia*), in some general points, but the microscope shows the structures of the three to be widely different.

Fig. 104. RYTIPHLÆA PINASTROIDES.

Colour. Dull red ; clear, when young ; dark, when old ; becoming black in drying.

Substance. Very firm ; elastic.

Character of Frond. Thread-like (*filamentous*) ; very bushy ; much branched. Filaments opaque ; closely marked with lines across (*transversely striate*). Branching irregular. Stem nearly simple at base ; much divided above ; set everywhere with very short thorn-like branchlets. Branches long, simple, spreading often, slightly incurved ; either alternate or on one side the stem only (*secund*) ; re-branched ; the lesser branches set with short, straight, or slightly incurved branchlets ; all turned to one side (*secund* therefore) ; making the branches look like so many small combs (see figure) ; tips often hooked in ; general outline spreading and fan-shaped.

Measurement. From 4 to 8 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate *capsules* ; external, on the branches. 2. *Tetraspores* imbedded in the ends of swollen branchlets.

Habitat. South coast of England. Isle of Wight, &c. Common.

A species of such peculiar growth that it is scarcely possible to confound it with any other. If a specimen be picked up from the shore and well shaken so as to disperse the water, the bushy branches will bristle out in all directions, instead of clinging together as they are apt to do in so many tufted plants. For other *Rytiphlaeas* see Plates XXIII. and XXV. The characteristic *lines across* (*transverse striæ*), are obvious in the younger branches, if examined through a pocket lens.

Fig. 105. POLYSIPHONIA ELONGATA.

Colour. Dark red ; becoming almost black in drying, all but the finer tips.

Substance. Stems robust and firm ; branchlets flaccid.

Character of Frond. Tufts of jointed threads (*filaments*) irregularly branched. Stems as thick as whipcord ; they and the branches tapering at both ends. (See figure.) Branches producing but few branchlets the first year. In winter, these and the tips of the branches die off, leaving the frond stunted, and often very unsightly till the following spring ; when a new growth commences ; the broken branches putting out vigorous shoots, which end in fine tufts of crimson branchlets, as figured in Fig. 106 ; and on these the fructification is borne. Joints marked with several upright lines (internal tubes) seen through the branchlets.

Internal Tubes. Four primary ones ; several secondary.

Measurement. From 6 to 12 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate, stalkless (*sessile*) *capsules* ; external ; on the branches ; either clustered or scattered. 2. *Tetraspores*, either imbedded in the ends of swollen branchlets, or borne in minute pod-like processes on the branches.

Habitat. Our coasts generally. On stones, shells, corallines, &c. In pools between tide-marks, and in from five to ten fathoms' water.

Although the structure is strictly jointed (*articulated*, see figure), the articulations of the stem and *primary* branches are indistinct, from the surface cells being small and irregularly placed. For other *Polysiphonias*, see Plate XXV. &c.

Fig. 106. POLYSIPHONIA ELONGATA. Var.

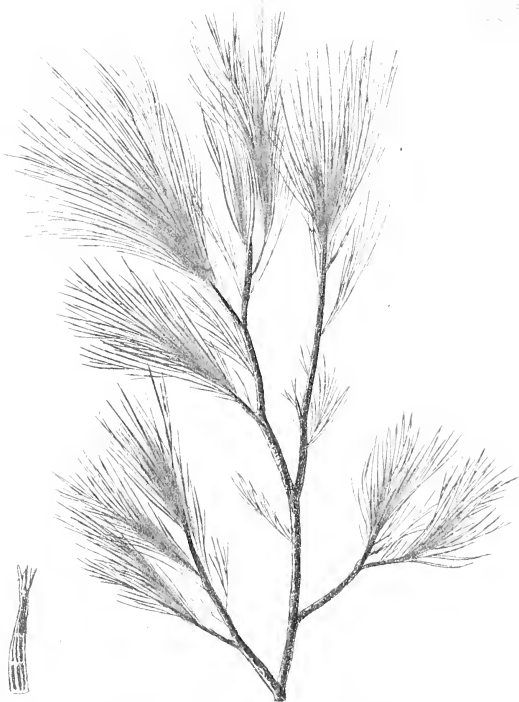
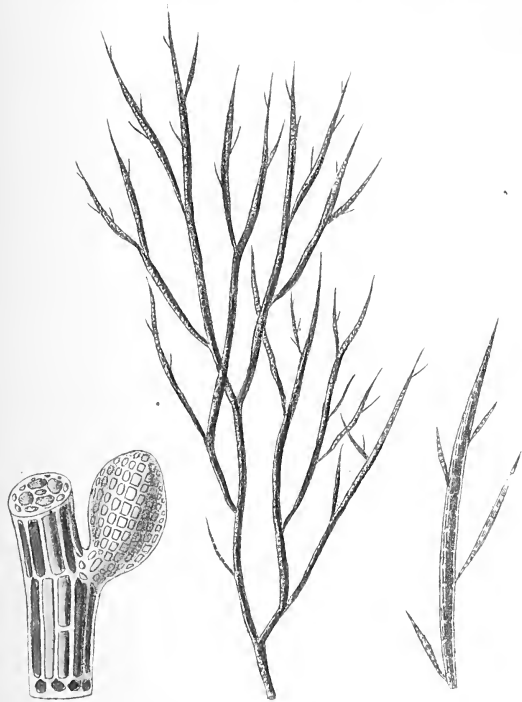
This form is no longer recognized as a variety, but merely as the second summer's condition of *P. elongata*. (See last description.) It is the var. γ . *sanguinolenta* of Agardh, and the *P. rosea* of Greville. In the same manner the bare winter condition was at one time taken for a variety, and called var. β . *denudata*.

102



Polypodium scolopendria

Polypodium prostratum



Polypodium scolopendria

Polypodium prostratum

PLATE XXV.

Fig. 107. DASYA VENUSTA.

Colour. Rosy red; stems brownish.

Substance. Very soft; tender.

Character of Frond. Thread-like (*filamentous*); much branched. Stem long, simple, semi-transparent, unjointed. Branches alternate; the lowermost longest; the rest gradually shorter upwards, giving the front a pyramidal outline; once or twice re-branched like a feather (*pinnate*); unjointed; but clothed throughout with very slender, hair-like branchlets, which are jointed and many times forked (*dichotomous*).

Measurement. From 3 to 4 inches long.

Fructification. Of two kinds; external. 1. Clustered *spores* in ovate *capsules*, with a protruding mouth (*urceolate*, see figure); unstalked. 2. *Tetraspores* in pointed oblong, *stichidia*; stalked.

Habitat. Jersey. Cast ashore. Very rare.

Fig. 108. RYTIPHLŒA COMPLANATA.

Colour. Brown-red; becoming almost black in drying.

Substance. Firm, elastic.

Character of Frond. Thread-like (*filamentous*), but compressed; much branched. Filaments opaque; closely marked with lines across (*transversely striate*). Stem erect; nearly simple below; much branched above. Branches erect, but spreading; twice or thrice re-branched, like a feather (*pinnate*); the lower branchlets always short or stunted; the upper longer, straight, rod-like; giving a stiff, formal character to the plant.

Measurement. From 2 to 3 inches long.

Fructification. Has not been found in Britain.

Habitat. South of England and West of Ireland (Miltown Malbay, in one particular pool, abundant). On the rocky beds of shallow tide-pools, exposed at low-water mark to full sunshine. Very rare.

The lines across (*transverse striæ*) characteristic of the genus, look in this species as if they were arched, but this is an optical delusion. They are best observed through a pocket lens.

Fig. 109. POLYSIPHONIA URCEOLATA.

Colour. Full red; becoming dark in drying.

Substance. Rigid; wiry.

Character of Frond. Long, dense, bushy tufts of jointed threads (*filaments*); much branched; loosely entangled. Branches partly forked (*sub-dichotomous*); partly alternate; erect, but spreading; more or less furnished with very short, alternate, spreading or back-curved (*re-curved*) branchlets. Joints marked with two broad upright lines (internal tubes seen through); or, if the filament be twisted, part of a third becoming visible.

Internal Tubes. Four.

Measurement. From 3 to 9 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in *capsules*; external. *Capsules* generally stalked, ovate, with a protruding mouth (*urceolate*). 2. *Tetraspores* immersed in the upper part of swollen branchlets.

Habitat. Our coasts generally. On rocks between tide-marks, or on the stems of *Laminaria digitata*. Common.

Varying very much in delicacy. Often as thick as horsehair at the base of the filaments, but sometimes approaching the slenderness of *P. formosa*. It is always more rigid in substance, however, and its short back-curved branchlets are another mark of distinction, particularly in specimens growing on *L. digitata*.

Fig. 110. POLYSIPHONIA FORMOSA.

Colour. Full red ; becoming dark in drying.

Substance. Exceedingly soft and flaccid. Soon decomposing in fresh water.

Character of Frond. Long, dense tufts of jointed threads (*filaments*); exceedingly slender; much branched. Branches partially forked (*sub-dichotomous*); long; wavy; bearing a second or third series; branchlets scattered, spreading, feathery. Joints marked with two broad upright lines (internal tubes seen through).

Internal Tubes. Four.

Measurement. From 6 to 10 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in *capsules*; external. Capsules generally stalked, ovate, with a protruding mouth (*urceolate*). 2. *Tetraspores* immersed in the middle part of the last branchlets.

Habitat. Our coasts generally. On rocks, &c. near low-water mark. Not so common as *P. urceolata*.

Perhaps only a delicate and elegant variety of *P. urceolata*, but so flaccid that it is best laid out in sea-water.

Fig. 111. POLYSIPHONIA OBSCURA.

Colour. Dark brown-red ; nearly black in drying.

Substance. Soft.

Character of Frond. Densely matted patches of short, very slender, jointed threads (*filaments*); creeping on the surface of rocks; attached by minute fibres which issue from the lower surface; throwing up from the upper erect or curved, simple branches; which are either naked or furnished with a few branchlets on one side (*secund*). Joints marked with many upright lines (internal tubes seen through).

Internal Tubes. Twelve or thirteen.

Measurement. Upright branches from $\frac{1}{4}$ to $\frac{1}{2}$ an inch long. Patches from 6 inches to 1 foot in extent.

Fructification. Only one kind found. *Tetraspores* immersed in swollen branchlets.

Habitat. Jersey and Sidmouth. On rocks at half-tide level. Sometimes parasitic on algæ; covering the roots of *Fuci*.

Fig. 112. POLYSIPHONIA PULVINATA.

Colour. Dull, brownish-red, or purplish; not much darker in drying.

Substance. Very soft and flaccid; soon decomposing in fresh water.

Character of Frond. Short, dense, intricate tufts of jointed threads (*filaments*); rising from a mass of creeping fibres. Filaments closely interwoven; very slender; wavy; sparingly and irregularly branched, in a forked manner (*dichotomously*); more or less furnished with small, spreading, or back-curved (*re-curved*) simple branchlets. Joints marked with two upright lines (internal tubes).

Internal Tubes. Four.

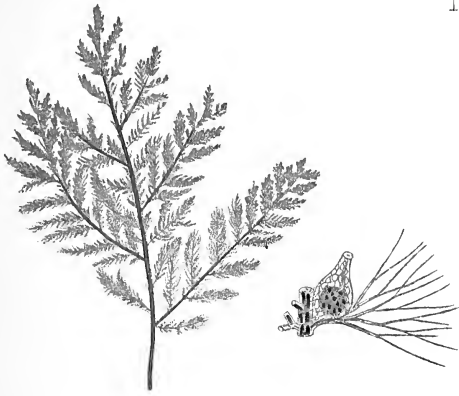
Measurement. About an inch in height.

Fructification. Of two kinds. 1. Clustered *spores* in very large, ovate, stalked *capsules*, with a protruding mouth (*urceolate*); external. 2. *Tetraspores* immersed in swollen branchlets.

Habitat. Our coasts generally. On rocks and algæ between tide-marks. Not uncommon.

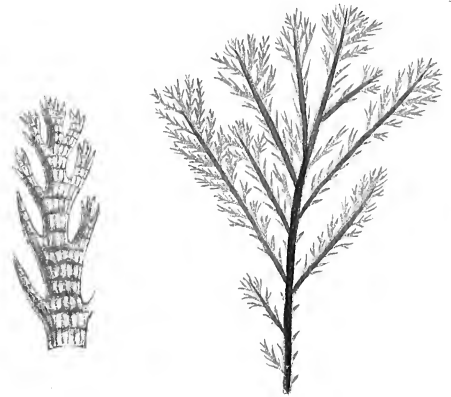
This looks like a miniature *P. urceolata*, but its substance is extremely flaccid. It should be laid out in sea-water.

107.



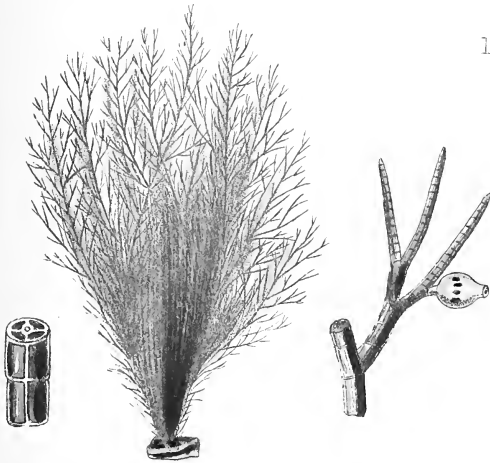
Dasya venusta, Harv.

108.



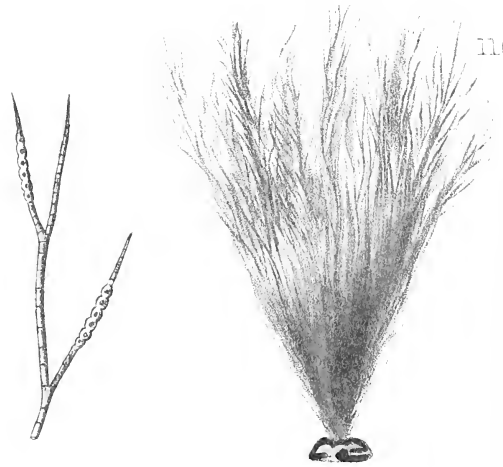
Rytiphloea complanata, Ag.

109.



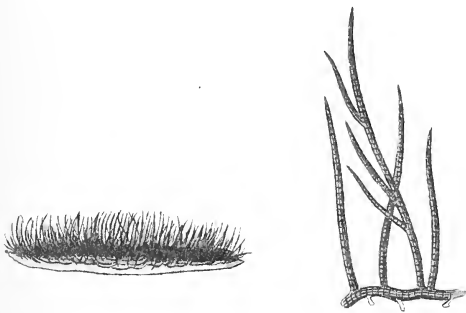
Polysiphonia urceolata, Gr.

110.



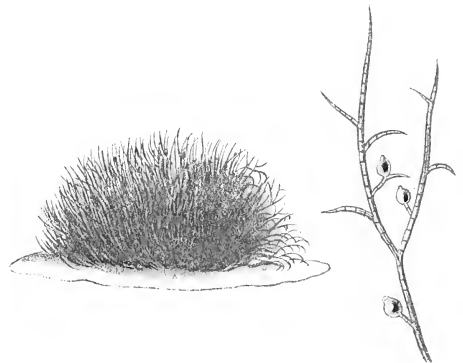
Polysiphonia formosa, Suhr.

111.



Polysiphonia obscura, JAg.

112.



Polysiphonia pulvinata, Spreng.

PLATE XXVI.

Fig. 113. POLYSIPHONIA FIBRATA.

Colour. Dark red-brown below ; rosy above.

Substance. Tender and gelatinous ; decomposing rapidly in fresh water.

Character of Frond. Very dense tufts of jointed threads (*filaments*) ; much branched. Stems as thick as hogs' bristles below, becoming very fine upwards ; simple or alternately branched. Set at greater or less distances with very slender, forked (*dichotomous*) branchlets, more or less tufted ; whose abrupt (*truncate*) tips are clothed with colourless, forked (*dichotomous*) fibres, bearing at certain seasons tiny yellow pods (*antheridia*), whose office is not thoroughly ascertained. Angles of branching (*axils*) all spreading. Marked throughout with two upright lines (internal tubes).

Internal Tubes. Four.

Measurement. From 2 to 10 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate or globose *capsules* ; external ; plentifully scattered. 2. *Tetraspores* immersed in the swollen upper branchlets.

Habitat. Our coasts generally. On rocks, stones, and algæ, between tide-marks. Not uncommon.

Fig. 114. POLYSIPHONIA SPINULOSA.

Colour. Dark red.

Substance. Rigid, though fine.

Character of Frond. Short, delicate tufts of jointed threads (*filaments*) very much branched. Branching alternate. Branches spreading ; irregularly set ; clothed with short, straight, spreading branchlets ; several times re-branched ; the last set, thorn-like, and horizontally spread ; their tips sometimes minutely divided ; each division bearing a long, colourless, jointed thread. Joints marked by two or three upright lines (internal tubes).

Internal Tubes. Four large and several lesser ones ; more of these in the branches than branchlets.

Measurement. One or 2 inches long.

Fructification. Only one sort observed. Clustered *spores* in globose, unstalked (*sessile*) *capsules* ; external.

Habitat. Appin. Very rare.

A plant which, like the next, has only been found once ; the solitary specimens being preserved in Sir William Hooker's Herbarium.

Fig. 115. POLYSIPHONIA RICHARDSONI.

Colour. Dull red ; becoming darker in drying.

Substance. Rigid ; elastic.

Character of Frond. Small tufts of jointed threads (*filaments*) much branched. Stem, hogs'-bristle thickness at base ; finer above ; alternately branched throughout ; the branches long, spreading, often issuing horizontally ; set in the upper part with widely-spreading, straight, partly forked (*sub-dichotomous*), partly alternate branchlets. Main joints marked with several irregular lines (internal tubes), twisted.

Internal Tubes. Five.

Measurement. Three or 4 inches long.

Fructification. Only one kind observed. Clustered *spores* in globose, unstalked (*sessile*) *capsules* ; external.

Habitat. Colvend, Dumfries.

Fig. 116. POLYSIPHONIA GRIFFITHSIANA.

Colour. Brownish below ; above, rosy pink.

Substance. Rigid below ; elastic ; the branchlets soft ; but not decomposing easily in fresh water.

Character of Frond. Short tufts of jointed threads (*filaments*), very much branched. Stems hogs'-bristle thickness at base, gradually finer upwards ; alternately branched throughout. Branches long, spreading ; simple or divided ; set with numerous, variously branched, slender, spreading branchlets ; the last ones often bent back (*re-curved*). Length of joints equal throughout (which is not usual). Marked by four upright lines (internal tubes) of irregular widths.

Internal Tubes. Four large, four small secondary ones.

Measurement. Three or 4 inches long.

Fructification. Only one kind observed. Clustered *spores* in broadly ovate *capsules*.

Habitat. Torquay. Parasitical on *Polyides rotundus*. Isle of Portland. Very rare.

Fig. 117. POLYSIPHONIA ELONGELLA.

Colour. Stems brownish ; branchlets rose-red.

Substance. Rigid below ; soft above.

Character of Frond. Small tufts of jointed threads (*filaments*), much branched. Branching partly forked, partly alternate. Stems the thickness of a hog's bristle below, as fine as hair above. Main branches distant ; very wide-spread ; more or less furnished with soft tufts of long, often-divided branchlets, which taper to the tips, but not, as in *P. elongata*, to the base also. Joints marked with two or three upright lines (internal tubes).

Internal Tubes. Four.

Measurement. From 2 to 4 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in large, ovate, shortly-stalked *capsules* ; external. 2. *Tetraspores*, immersed in the middle of swollen branchlets.

Habitat. Our coasts generally ; Isle of Man, West Coast of Scotland. On rocks and stones and the smaller algæ near low-water mark, and at a greater depth. Rather rare.

The winter and summer states of this plant differ as much as those of *P. elongata*, which it strongly resembles in miniature ; and which it is like in the annual dying off of its more delicate branchlets (see under *P. elongata*). But there are certain marks by which the two may be distinguished. The branches of *P. elongella* do not taper to the base like those of *P. elongata* ; and the joints are distinctly visible in all the main branches as well as in the branchlets. It is also a much smaller and more delicate plant in general appearance.

Fig. 118. POLYSIPHONIA CARMICHAELIANA.

Colour. Reddish brown ; becoming black in drying.

Substance. Rigid.

Character of Frond. Tufts of jointed threads (*filaments*) ; branched. Stem set throughout with scattered, alternate, wide-spreading branches of irregular lengths. Branches short, scattered, almost horizontally spread, irregularly forked (*dichotomous*), spine-like. Joints not visible in the stem and principal branches, but these marked with from two to four upright lines (internal tubes). Branchlets visibly jointed.

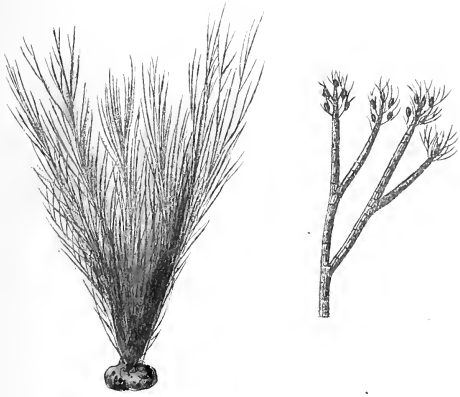
Internal Tubes. Four.

Measurement. Four inches long.

Fructification. Has not been observed.

Habitat. Appin. On *Desmarestia aculeata*. Very rare.

113



Polysiphonia fibrata, Harv

114



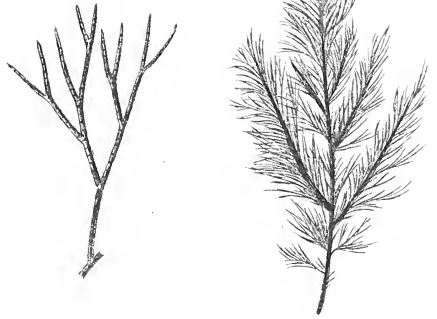
Polysiphonia spinulosa, Grv

115



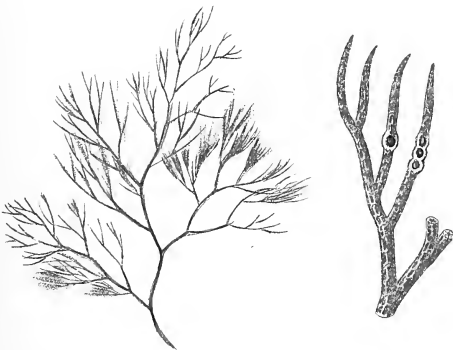
Polysiphonia Richardsoni, Hook

116



Polysiphonia Griffithsiana, Harv

117



Polysiphonia elongella, Harv

118



Polysiphonia Carmichaeliana, Harv

PLATE XXVII.

Fig. 119. POLYSIPHONIA VIOLACEA.

Colour. Brownish-red or purple.

Substance. Tender ; gelatinous ; soon decomposing in fresh water.

Character of Frond. Thread-like (*filamentous*), solitary, or tufted ; jointed ; very much branched. Principal stem sometimes rather robust ; sometimes much more slender than a hog's bristle ; set throughout with long, irregularly alternate, four-spread (*quadrifarious*) branches, of unequal length, but gradually diminishing upwards. Branches re-branched in a similar way with two, three, and even four sets ; these gradually lessening in diameter and length ; so that the plant has a remarkably feathery or finely bushed character. The last branchlets exceedingly slender, and, when young, tipped with fibres. Joints of the stems indistinct ; of the branchlets obvious, with two or three upright lines (internal tubes).

Internal Tubes. Four.

Measurement. From 6 to 8 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate, stalkless, or shortly-stalked, *capsules* ; external. 2. *Tetraspores*, large ; immersed in the swollen branchlets.

Habitat. Our coasts generally. On rocks, stones, and lesser algæ near low-water mark. Not uncommon.

Rather like *P. fibrata*, but a larger and more luxuriant plant, and not obviously jointed throughout. The cobweb-like last set of branches are sometimes a beautiful violet colour, especially when dried. It is best to lay out this plant in sea-water.

Fig. 120. POLYSIPHONIA BRODIÆI.

Colour. A dark brownish-purple or red.

Substance. Gelatinous ; instantly beginning to decompose if immersed in fresh water, and giving out a disagreeable smell.

Character of Frond. Long tufts of jointed threads (*filaments*), very much branched. Stems robust, elastic, undivided, opaque. Branches numerous, alternate, rod-like ; clothed with short, soft, repeatedly-divided, tuft-like branchlets, from half an inch to an inch long. Branching always alternate. Joints not visible in the stems and branches ; obvious in the branchlets, which are marked with three or four upright lines (internal tubes).

Internal Tubes. About seven.

Measurement. From 6 to 14 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate *capsules*, slightly stalked ; external. 2. *Tetraspores* immersed in the swollen tips of the finer branchlets.

Habitat. Our shores generally. On rocks and corallines near low-water mark. Not uncommon.

This beautiful *Polysiphonia* should always be laid out in sea-water. The first touch of fresh water destroys something of its beauty, by causing the tips of the delicate, tuft-like branchlets to decompose and break off.

Fig. 121. POLYSIPHONIA NIGRESCENS.

Colour. A dull brown, sometimes a purplish red; old plants becoming black; all, darker in drying.

Substance. Rigid below; soft and delicate above.

Character of Frond. Long tufts of jointed threads (*filaments*), very much and variously branched. Stems robust, nearly simple; sometimes set throughout with richly feathered branches. In autumn and winter rough below with broken remains; bushy above. Branches long, alternate; repeatedly re-branched in a feather-like manner (*pinnate*); the sets becoming gradually more and more slender. Branchlets short, alternate, distant, below; the uppermost often crowded together; mostly simple, awl-shaped. Joints closely marked with numerous upright lines (internal tubes).

Internal Tubes. From twelve to twenty.

Measurement. From 6 to 8 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in broadly ovate, unstalked *capsules*, with a narrow opening; external. 2. *Tetraspores* immersed in the lesser branchlets.

Habitat. All round our coasts. On rocks, stones, and algæ between tide-marks. Very common.

Summer specimens are feathery and beautiful; autumn and winter ones coarse and bushy. But, independently of this, it is one of the most variable of sea-weeds. Dr. Harvey considers its "distantly pinnate" branchlets, and the great number of its tubes sufficiently characteristic marks, but he has recorded seven American varieties, and Britain could add more. In one short stiff form it assumes the characters of *Rytiphlaea thuyoides* so strongly, that nothing but the microscope can separate them. (See under *Rytiphlaea thuyoides*.)

Fig. 122. POLYSIPHONIA AFFINIS.

Colour. A dull, pale, reddish-brown.

Substance. Firm below; soft above.

Character of Frond. Long tufts of jointed threads (*filaments*) much branched. Stems as thick as bristles below; irregularly forked; or alternately branched. Branches spreading; naked at base, finely divided and ovate in outline above; lesser branchlets all naked at base; furnished above with a few very upright, alternate, or secund branchlets, the lowermost longest. Joints of the stem obscure; those of the branches obvious; marked with numerous upright lines (internal tubes).

Internal Tubes. About sixteen.

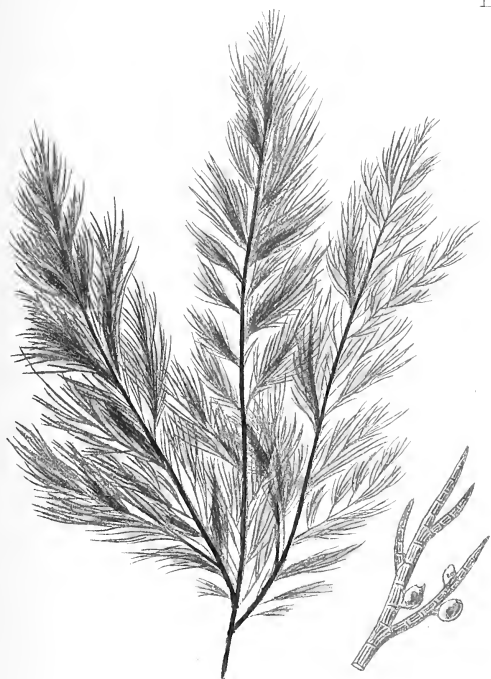
Measurement. From 4 to 8 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate or nearly globose, stalked *capsules*; external. 2. *Tetraspores* large; immersed in the lesser branchlets.

Habitat. Clamlough, near Glenarm, Ireland. Cushendall, ditto. On rocks, &c. in the sea, and thrown up from deep water.

Dr. Harvey considers this almost *too* closely allied to *P. nigrescens*. Its branching is more loose, its internal tubes fewer, its colour paler, its branches more wavy, and its substance softer. Yet he could be "well contented to regard it as a deep-water form of that species." Nevertheless, figures of the typical forms of each are different. (See the figures.)

119.



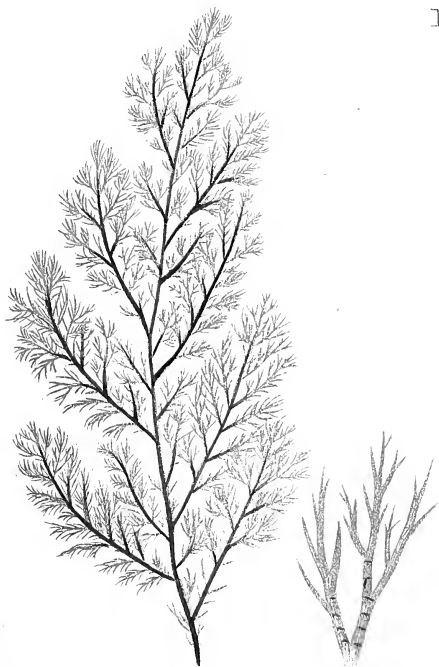
Polysiphonia violacea, Grac

120.



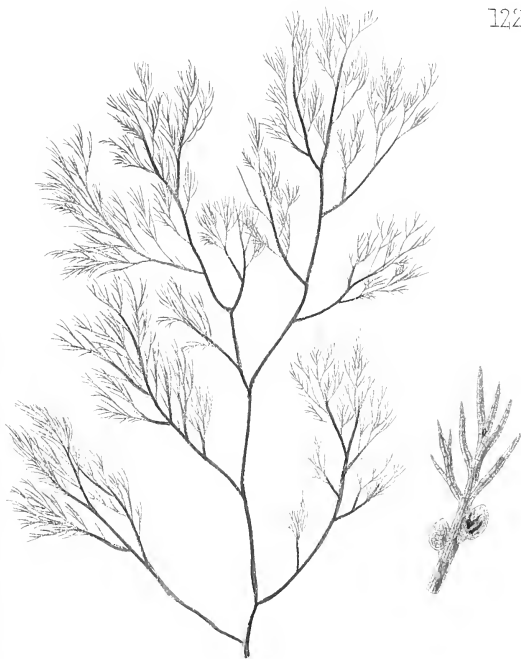
Polysiphonia Brodiaei Grac

121.



Polysiphonia nigrescens, Grac

122.



Polysiphonia affinis, Moore

PLATE XXVIII.

Fig. 123. POLYSIPHONIA FIBRILLOSA.

Colour. Brownish-red in deep water; pale straw in shallow pools; becoming purplish in drying.

Substance. Tender and gelatinous; soon decomposing.

Character of Frond. Thread-like (*filamentous*); solitary or tufted; jointed; very much branched. Stem robust below; becoming finer upwards; simple, or once or twice divided; naked near the base; then set throughout with short, slender, finely-divided side-branchlets, whose tips are clothed with fibres. Branches rather robust, wide-spread; of various lengths; the lowermost generally longest; sometimes simple, but usually many times re-branched, each set more slender than the last (these also, in luxurious specimens, set with short, slender branchlets); the last branchlets hair-like; their tips splitting into numerous cobweb-fine fibres (*fibrilliferous*). Joints not visible in the stem nor lower part of the branches; obvious above; marked by two or three upright lines (internal tubes).

Internal Tubes. Four.

Measurement. From 6 to 10 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in broadly ovate, scarcely stalked *capsules*; external. 2. *Tetraspores* immersed in swollen, distorted branchlets; large.

Habitat. Our coasts generally. On rocks, stones, and algæ between tide-marks. Often in pools left by the falling tides. Frequent.

Fig. 124. POLYSIPHONIA VARIEGATA.

Colour. A dark purple-brown; brighter when dry.

Substance. Rigid below; very soft above.

Character of Frond. Dense tufts of jointed threads (*filaments*) much branched; as thick as hogs' bristles below; hair-like above. Branching forked (*dichotomous*); the lower angles of branching (*axils*) very wide-spread. Branches somewhat zigzag, long, much divided; set with tufts of very fine, delicate, closely-forked branchlets. Joints clearly visible throughout; marked by three broad, upright lines (internal tubes).

Internal Tubes. Six; sometimes, but rarely, seven.

Measurement. From 4 to 10 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in broadly ovate, wide-mouthed, shortly-stalked *capsules*; external. 2. *Tetraspores* immersed in swollen branchlets.

Habitat. Plymouth, and various places near it. On mud-covered rocks in bays and estuaries. Also on *Zostera*, *Chorda filum*, floating timber, &c. Very local, and therefore rare in Britain. Common at Venice and in North America.

Fig. 125. POLYSIPHONIA SIMULANS.

Colour. Reddish.

Substance. Stiff and brittle.

Character of Frond. Tufts of jointed threads (*filaments*) branched from the base; bushy. Stems irregularly set with spines which hold the plant together, so that it is difficult to disentangle. Branches alternate, wide-spread, repeatedly but irregularly branched like a feather (*pinnate*); the last set but one, long and simple; set with short, distant, spine-like branchlets. Joints visible throughout; marked with many upright lines (internal tubes).

Internal Tubes. About twelve.

Measurement. From 2 to 3 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in nearly globose or ovate *capsules*, with a wide mouth; external. 2. *Tetraspores* immersed in swollen branchlets.

Habitat. Jersey. Torquay. Orkney. On rocks and in tide-pools near low-water mark. Rare.

Fig. 126. POLYSIPHONIA FURCELLATA.

Colour. When recent, a bright brick-red ; turning umber-brown when dry.

Substance. At first firm, but becoming soft immediately.

Character of Frond. Very slender tufts of jointed threads (*filaments*) much entangled, wavy, excessively branched. All the branching regularly and repeatedly, and, in the upper part, very closely forked (*dichotomous*); angles of branching (*axils*) broad and rounded ; branchlets upright, their points somewhat hooked in. Joints visible throughout ; marked with several slender, upright lines (internal tubes) which sometimes cross each other.

Internal Tubes. About eight.

Measurement. Five or 6 inches long.

Fructification. Not found in Britain.

Habitat. South shore of England and Ireland. Jersey. Found floating or by dredging. Very rare.

Fig. 127. POLYSIPHONIA FASTIGIATA.

Colour. Dark-brown ; reddish in deep water ; becoming yellowish on exposed rocks left by the tide ; drying quite black.

Substance. Rigid.

Character of Frond. Dense, globular tufts of jointed threads (*filaments*) excessively branched from the base. Filaments as thick as hogs' bristles, and of equal diameter throughout the plant. All the main branches forked (*dichotomous*) ; their angles of branching (*axils*) wide. Branchlets rather less regular ; being occasionally alternate. All the tips of the same length as if they had been cut to one level (forming a circle when laid out). Joints visible throughout ; marked with numerous upright lines (internal tubes) ; a dark central spot in each.

Internal Tubes. Sixteen or eighteen.

Measurement. From 2 to 4 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate-stalked *capsules*, with a narrow, protruding mouth ; external. 2. *Tetraspores*, immersed in swollen, distorted branchlets.

Habitat. Our coasts generally. Parasitic on *Fucus nodosus*, and *Fucus vesiculosus* ; but especially the former. Very common.

Fig. 128. POLYSIPHONIA PARASITICA.

Colour. A clear lake-red ; becoming brownish in drying.

Substance. Rigid, but not harsh.

Character of Frond. Delicate, feather-like tufts of jointed threads (*filaments*), very much branched. Stems rather compressed ; simple. Branches alternate, generally short below, longer above ; once or twice re-branched like a feather (*pinnated*) ; last branchlets simple, awl-shaped, acute, upright, alternate, closely set. Joints visible throughout ; marked with three or four lines (internal tubes) with transparent spaces between.

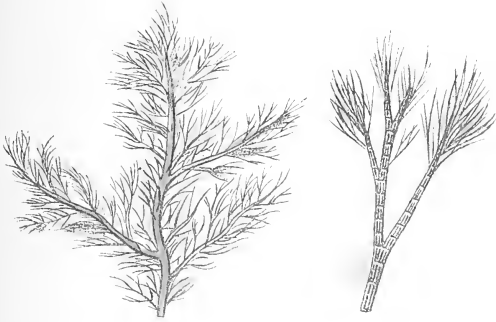
Internal Tubes. About eight.

Measurement. From $\frac{1}{2}$ inch to $1\frac{1}{2}$ long.

Fructification. Of two kinds. 1. Clustered *spores* in large ovate, shortly-stalked *capsules* ; external (very rare). 2. *Tetraspores*, immersed in swollen, much distorted branchlets.

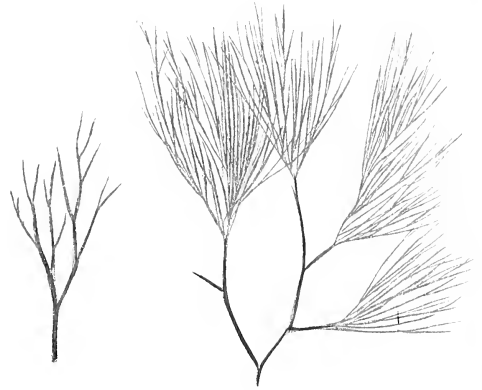
Habitat. Our coasts generally. Sometimes parasitic on the larger algæ. Oftener in pools near low-water mark ; growing on the pink incrustations formed by *Corallinas* and *Melobesias* ; where few other plants are to be seen.

123.



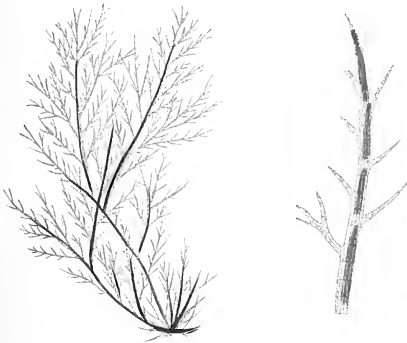
Polysiphonia fibrillosa, Grev.

124.



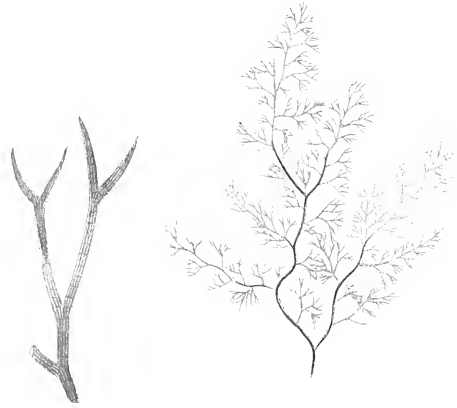
Polysiphonia variegata, Ag.

125.



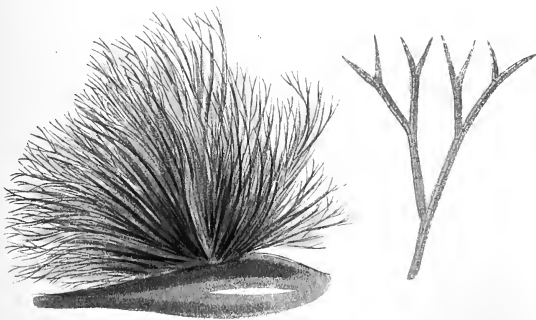
Polysiphonia simulans, Harv.

126.



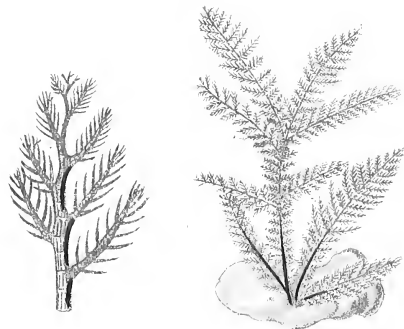
Polysiphonia furcellata, Harv.

127.



Polysiphonia fastigata, Grev.

128.



Polysiphonia parasitica, Grev.

PLATE XXIX.

Fig. 129. POLYSIPHONIA SUBULIFERA.

Colour. Purplish ; becoming darker in drying.

Substance. Stems elastic ; branchlets soft and tender.

Character of Frond. Tufts of jointed threads (*filaments*), much branched. Stems wavy ; as thick as hogs' bristles below ; becoming finer upwards ; once or twice divided. Branches wide-spread ; wavy ; of unequal lengths ; irregularly re-branched ; lesser branches long, rod-like ; furnished with very short, scattered, simple, spine-like, almost horizontal branchlets. (See figure of a magnified bit.) Joints visible throughout ; marked with from four to six upright lines (internal tubes).

Internal Tubes. About thirteen.

Measurement. Four or 5 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate *capsules* ; external : 2. *Tetraspores* immersed in swollen branchlets.

Habitat. Torquay and Weymouth. Abundant in Roundstone Bay, Ireland. Dredged in from five to ten fathoms' water. Very local, therefore rare.

This species bears a greater resemblance to young specimens of *Rytiphlea fruticulosa* than to any other plant, but is softer and more slender, and may always be distinguished by its distinctly jointed stem and branches. Its peculiarly thorny habit is so unlike any other *Polysiphonia* of the same size, that it can hardly be confounded with any. It approaches nearest to the following (*P. atro-rubescens*), but the branches are much wider spread, and the branchlets are simple, not clustered in tufts.

Fig. 130. POLYSIPHONIA ATRO-RUBESCENS.

Colour. Deep red or brownish when full grown ; becoming black in drying ; the lesser branches of very young specimens bright red.

Substance. Rigid when full grown ; the branchlets soft when young.

Character of Frond. Dense tufts of jointed threads (*filaments*) ; or covering the rocks in wide patches ; more or less sparingly branched. Stems thicker than horse-hair, simple or nearly so ; more or less furnished with long, upright, simple branches. Branches sometimes re-branched ; furnished in greater or less abundance with very short, awl or spindle-shaped, upright branchlets, scattered singly or in tufts. Joints visible throughout ; marked with several lines (internal tubes) ; sometimes, but not always, spirally curved. Root fibrous (not usual in *Polysiphonias*).

Internal Tubes About thirteen.

Measurement. From 2 to 6 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in nearly globose, wide-mouthed *capsules* ; external : 2. *Tetraspores* immersed in swollen branchlets.

The young state of this plant is wanting in the tufted branchlets, and the tops of the branches are very soft and bright red, retaining the colour in drying. Such specimens are, however, generally found with their roots, which, being fibrous, instead of the more common disc, serve as a clue to the species. For one other *Polysiphonia*, see Plate XXX. Fig. 134.

Fig. 131. LAURENCIA PINNATIFIDA.

Colour. Properly a livid purple, or dull purplish red; but varying from that to many shades of green and yellow; the deeper the water in which it grows, the finer the colour.

Substance. Thick; elastic; fleshy; giving out a strong, disagreeable smell.

Character of Frond. Compressed; narrow; tufted; very formally branched; all the divisions as if imperfectly cut out of a flat surface (*pinnatifid*). Stems simple; from one-twelfth to one-sixth of an inch across; often tapering to the base and widening upwards; but sometimes the reverse. Branches long, alternate, upright; twice re-branched or oftener; each set one-third the length of the last; the final ones short, obtuse, simple or divided (*lobed*). Root fibrous.

Measurement. From 1 to 12 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in broadly ovate, unstalked (*sessile*) capsules; external; on the corners of the smaller divisions. 2. *Tetraspores* immersed in the branchlets.

Habitat. All round our coasts. On rocks from near high-water mark down to deep water. Common.

Increasing in luxuriance, as well as deepening in colour, the lower it grows: miserably stunted and discoloured on rocks often exposed. There are two named varieties (and many variations): β . *osmunda* and γ . *tenuissima*. In β . *osmunda* the branches are short and many times divided at the ends; in γ . *tenuissima* they are very thin, much branched and widely spread. Among variations from the character represented in the figure may be named that where the stem tapers at the base, and the frond widens so much upwards, that the cutting out of the upper branches is rather indicated than accomplished. Or instead of the lowermost branches on the stem being longest, they will sometimes be shortest, so that the plant becomes fan-shaped above. But the character of imperfectly cut out branching prevails throughout.

Fig. 132. LAURENCIA OBTUSA.

Colour. Dull, semi-transparent red at first, quickly changing to a rosy pink, which is very fleeting, and soon passes into the waxy yellow and white of decay.

Substance. Crisp when perfectly recent; soon becoming soft, and decomposing.

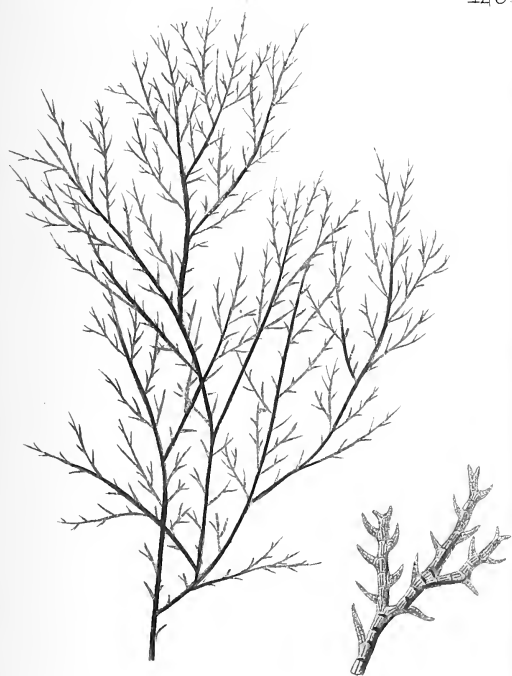
Character of Frond. Cylindrical; branched; tufted. Stems as thick as a sparrow's quill; undivided or somewhat forked. Branches long, irregularly set round the stem (sometimes three or four from one level); the lowermost generally longest; gradually shortening upwards; twice or thrice re-branched; each set diminishing greatly in length. Last branchlets extremely short, mostly opposite or in threes; almost horizontally set; narrowed at the base, widening upwards, blunt at top as if swollen.

Measurement. From 3 to 6 inches long.

Fructification. Of two kinds. Clustered *spores* in ovate capsules; external, on the tips of the smaller branches. *Tetraspores* immersed in the ends of the final branchlets.

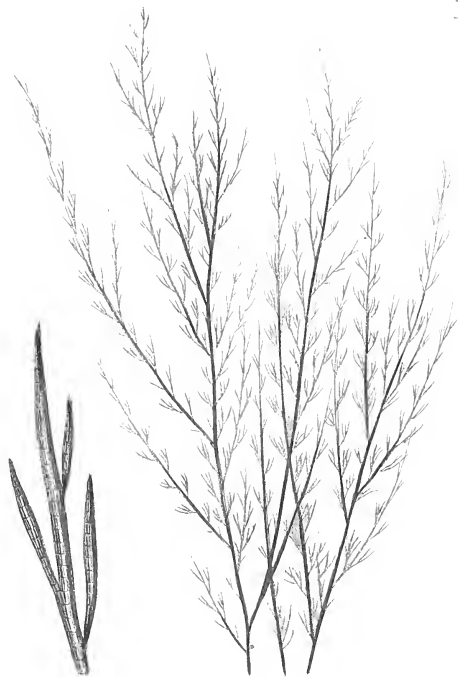
Whereas the frond of *Laurencia pinnatifida* is characterized by being so entirely at one level that its branches look as if they had been cut out rather than grown, *Laurencia obtusa* is so entirely the reverse, that a fresh-gathered specimen stands out in all directions, from the fact that its branches issue at various points round the stem (fir-tree fashion). It is not often the plant is picked up otherwise than the rosy pink usually described, for the process of decay soon begins when it is once thrown ashore; but those who have met with it abundantly in its crisp condition when quite recent, are aware that the beautiful colour it assumes soon after, is the first stage of a change. It is by no means a pretty hue until exposed for a short time, or plunged in fresh water.

129



Polysiphonia subulifera, Ag.

130



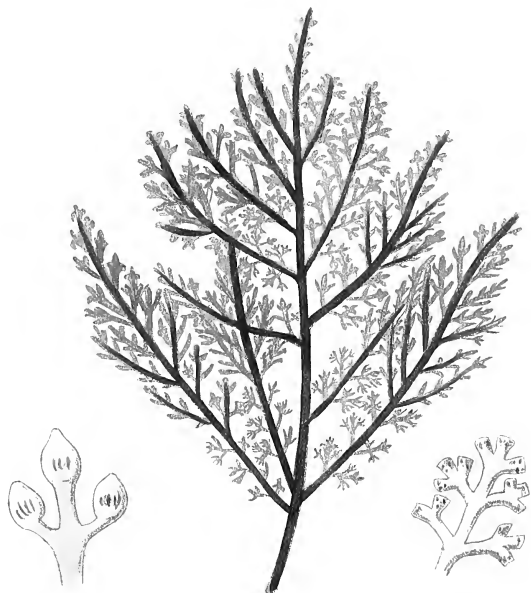
Polysiphonia atro-rubescens, Græ.

131



Laurencia pinnatifida, Lamour.

132



Laurencia obtusa, Lamour.



PLATE XXX.

Fig. 133. BONNEMAISONIA ASPARAGOIDES.

Colour. Brilliant rosy red ; rather darker from the west of Ireland.

Substance. Very soft and delicate.

Character of Frond. Thread-like (*filamentous*), but rather compressed ; delicately, and very much branched. Stem undivided ; set on each side with long, alternate branches, which are either simple or re-branched. Stem and branches fringed throughout with very slender, short, awl-shaped branchlets, regularly alternate. The whole frond at one level (*distichous*).

Measurement. From 4 to 12 inches long.

Fructification. Only one sort known. Clustered *spores* in ovate, shortly-stalked *capsules*, which are always placed exactly opposite one of the fringing branchlets.

Habitat. The milder stations on our coast. West of Scotland, Isle of Man, Devonshire, &c. Ireland generally. On rocks near low-water mark, and at a greater depth. Not very uncommon.

A variety of this most graceful plant is found at Wicklow and in Kingstown Harbour. *β teres*. It is thoroughly thread-shaped (*filiform*) throughout, (cylindrical, *i. e.* instead of compressed;) and the fringing branchlets are very long. *Bonnemaisionia* evidently loves a genial climate, becoming more and more luxuriant in proportion to the warmth of the sea it inhabits. The slender fringing branchlets, regularly alternate, with a *spore-capsule* opposite each, when in fruit; combined with the brilliant colour, distinguish this plant from every other British species. And it is generally, if not always, in fruit when thrown ashore, which happens sometimes, in great profusion, for a few weeks during the summer.

Fig. 134. POLYSIPHONIA BYSSOIDES.

Colour. A fine clear red when young ; browner when old, and after exposure to the air, or in drying.

Substance. When young and luxuriant, soft ; all but the stems, which are gristly ; when old, rigid.

Character of Frond. Thread-like (*filamentous*) ; tufted ; very much branched. Stem undivided ; branched like a feather (*pinnate*). Branches simple, slender, the lowermost longest ; gradually shorter upwards ; several times re-branched ; the lesser divisions more or less densely clothed with tufts of once or twice forked, spreading, cobweb-like branchlets, which give the frond a beautifully feathery appearance. Joints visible throughout, though often difficult to observe from the crowded branchlets. Stem and branches marked with three or four upright lines (internal tubes). Branchlets single-tubed.

Internal Tubes. About eight.

Measurement. From 4 to 12 inches long.

Fructification. Only one kind observed. Clustered *spores* in ovate, stalked *capsules* ; external ; on the lesser branches.

Habitat. Our coasts generally. On stones and shells, and algæ near low-water mark, and in deeper water. Common.

A stunted sort of variety with the tufts of branchlets stiff, crowded, and thorn-like (not unlike the magnified branch of the variety *denudata* of *Dasya coccinea*, Fig. 135), and the whole plant a dull brown, can scarcely be recognised when compared with luxurious feathery specimens of this plant.

Fig. 135. DASYA COCCINEA.

Colour. A dull or fine crimson, becoming scarlet on exposure or in fresh water.

Substance. Elastic; firm; but turning soft and decomposing after a few hours in fresh-water.

Character of Frond. Thread-like (*filamentous*); delicately, much branched. Stems robust and rough with minute hair-like fibres; generally undivided; branched like a feather (*pinnate*). Branches simple, alternate, the lowermost longest, gradually shorter upwards; twice re-branched; the last branchlets many times forked. Stem and branches opaque; branchlets jointed.

Measurement. From 6 to 8 inches long.

Fructification. Of two kinds; external. 1. Clustered *spores* in ovate, rather pointed, *capsules*; at the base of the branchlets: 2. *Tetraspores* in oblong, pointed, *stichidia*.

Habitat. Our coasts generally, on rocks, &c. near low-water mark. Common.

Var. *β. tenuior* is more slender in all its parts. Var. *γ* has naked branches, and the branchlets are minute, nearly simple, their points turning in all directions (*squarrose*). (See figure of magnified branch.) For other *Dasyas* refer back to Plate XXV. Fig. 107; and forward to Plate XXXI. Fig. 137; and Plate XXXIV. Fig. 152.

Fig. 136. CHRYSYMENIA CLAVELLOSA.

Colour. A dullish semi-transparent red when actually growing; soon becoming a beautiful brilliant pink.

Substance. Gelatinous; soft; slippery; adhering closely to paper.

Character of Frond. Bushy; thread-shaped (*filiform*); slender; much branched; tufted or solitary; tubular. Stems undivided; gradually widening from the base to the middle; thence diminishing to the end; alternately or irregularly branched. Branches long, undivided, opposite or alternate; once or twice re-branched; all the stems tapering to the base and top (*apex*); bearing one or more series of linear-lanceolate branchlets, closely set. They, as well as the branches, usually set on one level (*distichous*), but sometimes springing from all sides of the frond, making it a thick bush.

Measurement. From 3 to 12 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in conical, stalkless *capsules*; 2. *Tetraspores* immersed in the branchlets.

Habitat. Various stations on the coasts of England, Scotland, and Ireland. On rocks, &c. near low-water mark; and on the stems of *Laminaria*, at a greater depth. Not uncommon.

This plant is now called *Chylocladia clavellosa*, a name by which it was known many years ago. A short, very bushy variety, which cannot be laid out without a good deal of clipping of crowded branches, is to be found on the steep sides of the rocks not far from low-water mark, on the north side of Filey Bridge. It never turns the rosy pink of the larger and more usual plant; is less frequently divided, and has a tendency to bear its *tetraspores* in groups (*sori*), towards the middle and base of the branchlets. The usual (*normal*) form is very abundant, occasionally at Filey, but, like many other algæ, it is whimsical in its times of appearance. For another *Chrysymenia*, see Plate XXXI. Figs. 141, 142.

133.



Bonnemaisonia asparagoides, Ag.

134.



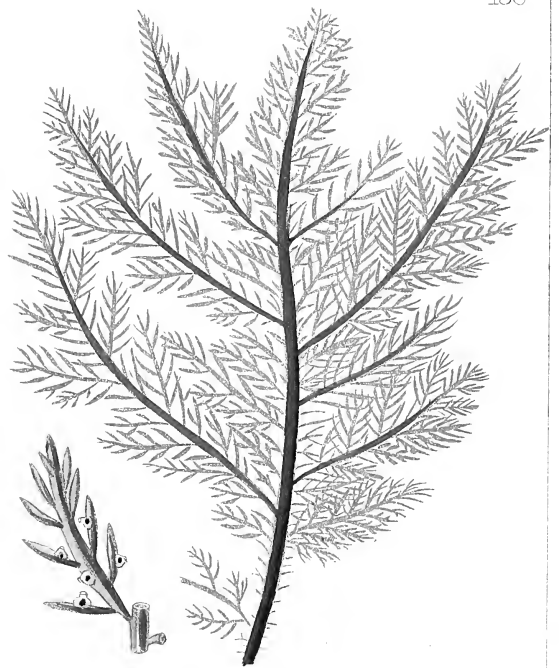
Polysiphonia lyssooides, Gr.

135.



Dasysaccocinea, Ag.

136.



Chrysiomenia clavellata, J. Ag.

PLATE XXXI.

Fig. 137. DASYA OCELLATA.

Colour. A brownish or bright purple.

Substance. Rigid for so small a plant; spongy.

Character of Frond. A delicate little bush; tufted. Stems simple or nearly so; as thick as hogs' bristles; opaque; unjointed; marked with veiny lines; densely clothed all round with short fringing branchlets which are specially crowded above, making all the tips strikingly round and blunt. Branchlets slender, erect, several times forked; jointed throughout.

Measurement. One or 2 inches high.

Fructification. Only one kind found in England; viz. *tetraspores*, in long, slender, pointed *stichidia*.

Habitat. South of England and Ireland. On mud-covered rocks near low-water mark. Rare.

Fig. 138. CHYLOCLADIA REFLEXA.

Colour. Purple or dull red.

Substance. Soft, membranaceous; not distinctly gelatinous.

Character of Frond. Small; creeping; oddly bent and branched. Lower branches cylindrical, slender, arched, tubular; attaching themselves to the rock, by tiny branchlets, tipped with discs. Secondary branches springing from the arched ones; very irregularly placed (sometimes three from one point), tapering at both ends; contracted at intervals as if drawn in; the joints so formed about once and a half as long as broad; sometimes bearing a few scattered, curved branchlets.

Measurement. Two or 3 inches high.

Fructification. Of two kinds. 1. Clustered *spores* in globose, unstalked (*sessile*) *capsules*; external: 2. *Tetraspores* immersed in the smaller branches.

Habitat. South and west coasts of England; Ireland, generally. On rocks near low-water mark.

Now *Lomentaria reflexa*. Dr. Harvey considers this a variety of *C. Kaliformis*.

Fig. 139. BOSTRYCHIA SCORPIOIDES.

Colour. Dull purple, becoming blackish in drying.

Substance. Elastic; but tender.

Character of Frond. Entangled tufts of slender threads (*filaments*), whose tips are more or less tightly curled in (like those of a young fern); very much branched. Branches very wide-spread; wavy; furnished with a second or third set, equally spreading; the uppermost with their tips turned in (*involute*). The whole frond set, at intervals, with short, many-times-divided branchlets; almost horizontally spread.

Measurement. Four or 5 inches high.

Fructification. Only one kind observed in England; viz. *Tetraspores* in lanceolate *stichidia*; external; borne either on the sides or ends of the branches. Very rarely found.

Habitat. Certain stations only on our coasts. Muddy sea-shores, near high-water mark; at the estuaries of rivers; in salt-water marshes and ditches, adhering to the roots of flowering plants; said also to grow on submarine rocks. Very local; therefore rare.

Fig. 140. LAURENCIA CÆSPITOSA.

Colour. Dark livid-purple in deep water ; greenish-yellow when exposed to sunlight.

Substance. Thickish ; elastic ; fleshy feeling.

Character of Frond. Cylindrical or nearly so ; as thick as a crow's quill ; nearly one width throughout ; formally branched ; tufted. Stems simple ; generally naked below ; much and stiffly branched above ; forming a pyramidal outline. Branches erecting ; spreading ; the main ones often opposite ; the lesser, alternate ; quite cylindrical. Branchlets often much crowded ; sometimes simple, sometimes much branched, alternately ; always very erect ; slightly tapering to the base ; blunt and abruptly cut off at top.

Measurement. From 2 to 8 inches high.

Fructification. Of two kinds. 1. Clustered *spores* in broadly ovate, unstalked (*sessile*) capsules ; external. 2. *Tetraspores* immersed in the branchlets like dots.

Habitat. Our coasts generally, within tide-marks. Common.

Fig. 141. CHRYSYMENIA ROSEA. Var. ORCADENSIS.

Colour. Bright rosy-red.

Substance. Delicately membranaceous.

Character of Frond. Flat ; leaf-like ; narrow-oblong ; pointed ; tapering to a thin stem (sometimes abruptly) ; furnished on each side with exactly opposite, narrow-oblong, leaf-like branchlets ; which now and then have the rudiments of a third set. One or many from a root.

Measurement. From 1 to 3 inches high.

Fructification. Only one kind ascertained. *Tetraspores* collected into groups (*sori*), imbedded in the surface of both leaves and leaflets.

Habitat. Skaill and Sanda Frith, Orkney. On rocks and *Laminaria digitata* in deep water.

Now *Chylocladia rosea*.

Fig. 142. CHRYSYMENIA ROSEA.

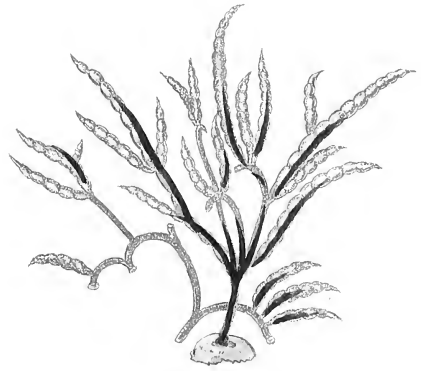
The description above given applies equally to this plant, except that the "narrow-oblong" shape is narrower in *Chrysymenia rosea vera* than in the Orkney variety ; and in this respect it closely resembles the American plants which Dr. Harvey found and named before the species was discovered in this country. *C. rosea* has many more habitats than *C. Orcadensis*. Filey, in crevices of rocks on the north side of the bridge, and on the stems of *Laminaria digitata* washed ashore in the bay ; Firestone Bay, near Plymouth ; the break-water under the Hoe ; and the shores of Mount Edgecombe, are among its stations ; by which it would appear that the lovely little plant is not particular about the climate it inhabits. A drawing in the *Brodie Herbarium* figures a plant of similar formation, except that the secondary leaflets are very narrow and very much drawn out, and in one or two cases (if a professedly "exact" copy may be trusted), bluntish at the tips. But specimens of much the same, and quite as extravagant peculiarities, were picked up at Filey in 1850, where the plant now figured was found ; and have occurred elsewhere ; it is to be presumed, therefore, that, like many other algæ, *C. rosea* is subject to vagaries of growth ; and that Professor Arnott is right in believing the now lost plant from which the drawing was made, to have been *Chrysymenia rosea vera*.

137.



Dasya ocellata, Harv.

138.



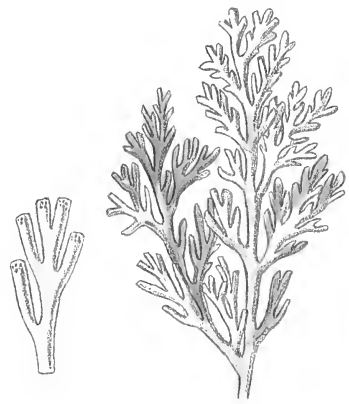
Chylocladia reflexa, Lamour.

139.



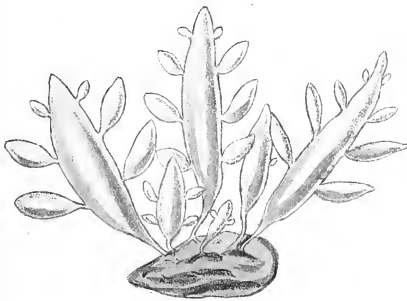
Bostrychia scorpioides, Mont.

140.



Laurencia caespitosa, Lamour.

141.



Chrysinemia rosea, var. Harv.

142.



Chrysinemia rosea, Harv.

PLATE XXXII.

Fig. 143. LAURENCIA TENUISSIMA.

Colour. Pale purplish or pinky-red ; soon becoming yellow.

Substance. Very tender ; somewhat gelatinous, though when fresh, elastic.

Character of Frond. Thread-like (*filamentous*) ; very slender ; cylindrical ; much branched ; tufted. Main stem generally undivided ; bearing numerous, alternate, spreading, wavy branches of unequal length ; some of the longest bearing a second series ; and all set with numerous, very short, slender, bristle-like, simple branchlets, which taper finely to each end.

Measurement. From 6 to 8 inches long ; $\frac{1}{24}$ of an inch in diameter !

Fructification. Of two kinds. 1. Clustered *spores* in ovate, unstalked *capsules* ; external on the branchlets : 2. *Tetraspores* imbedded in the fringing branchlets.

Habitat. South of England and Ireland. Jersey. Isle of Wight. On rocks between tide-marks ; generally in shallow pools about half-tide level. Very rare.

Slenderer than all the other *Laurencias*, and distinguishable from all by the fact of its branchlets tapering finely at *both* extremities, though more especially at their base. The figure does not give the bending delicacy of the real plant, but the magnified portion is good. An old name has been given back to this species : *Chondria tenuissima*.

Fig. 144. LAURENCIA DASYPHYLLA.

Colour. Pale-red or pink ; sometimes tinged with brown ; fading to yellow or green.

Substance. Somewhat gelatinous ; soon decomposing.

Character of Frond. Thread-like (*filamentous*) ; slender ; though not nearly so much so as *L. tenuissima* ; cylindrical ; much branched ; tufted. Main stems generally undivided ; bearing opposite or alternate branches ; the lowermost longest, and frequently bearing a second set ; all set with numerous short, club-shaped branchlets, tapering to the base, but blunt at the tips (*obtuse*).

Measurement. From 4 to 12 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in ovate *capsules* ; external on the lesser branches ; 2. *Tetraspores* imbedded in the branchlets.

Habitat. Shores of England and Ireland. On stones and shells in pools near low-water mark, generally where the surface is covered with sand or mud. Frequent.

The blunt tips of the branchlets in this species distinguish it from *L. tenuissima*. Both are remarkable for being marked throughout, at short distances, with lines across (*transverse striae*). These are visible under a good pocket lens in the younger parts of the frond ; though but faintly, generally. It is the internal structure showing through, which causes the appearance. This plant is now called *Chondria dasyphylla*.

Fig. 145. CHYLOCLADIA OVALIS.

Colour. Properly dark-red; discolouring green and brown as it grows old. Stems darker than the leaf-like branchlets.

Substance. Stems succulent, but firm and elastic; branchlets tender.

Character of Frond. Slender, thread-shaped (*filiform*), solid stems; bearing leaf-like, tubular branchlets; tufted. Stems naked below; once or twice forked above. Branchlets leaf-like; more or less narrow-oval; tapering at the base; usually simple, but occasionally contracted as if jointed; clustered, or scattered; often densely crowded.

Measurement. From 2 to 10 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in globose, unstalked (*sessile*) capsules; with a wide transparent border; external on the branchlets: 2. *Tetraspores* imbedded in the branchlets.

Habitat. Southern and western shores of England and Ireland. Western Isles of Scotland. Within tide-marks. Local, therefore rare.

Dr. Harvey describes it as luxuriant on the west coast of Ireland in the months of April and May, when its colour is good and its delicate branchlets in full perfection. But the plant is short-lived. "Two months later," he says, "its aspect is completely changed; great multitudes of the fronds have perished, and those that remain are faded in colour, with attenuated and more compound ramuli. By the end of August the plant has almost entirely disappeared." Now *Lomentaria ovalis*,—Agardh's name, not Dr. Harvey's, who considers it a true *Chylocladia*.

Fig. 146. CHYLOCLADIA KALIFORMIS.

Colour. A fugitive pink, or purplish-red; soon changing to greenish-yellow.

Substance. Soft and somewhat gelatinous.

Character of Frond. Cylindrical; tubular; constricted at intervals into long joints; profusely branched. Stems undivided, tapering to each extremity; the contractions at intervals of half an inch or more. Branches, springing from each joint-contraction; opposite, or set all round the stem (*whorled*); of the same construction as the stem, only slenderer and more regularly contracted; these contractions also furnished with sets of lesser branches and branchlets, all more or less distinctly jointed, and tapering at each end.

Measurement. From 4 to even 18 inches long.

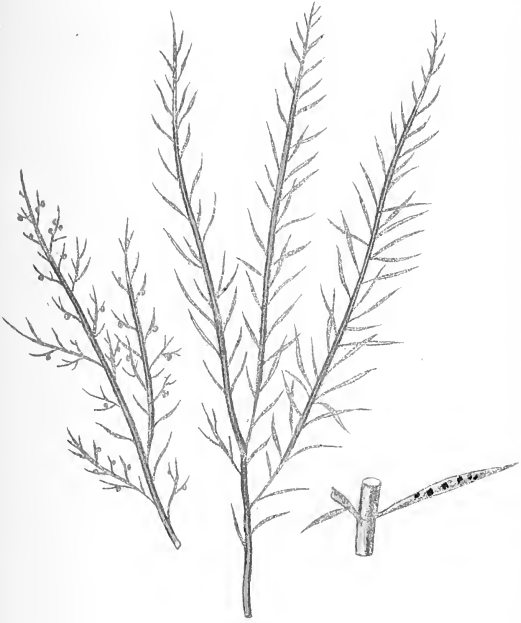
Fructification. Of two kinds. 1. Clustered *spores* in globose, unstalked (*sessile*) capsules, with a transparent border; external on the young branches. 2. *Tetraspores* imbedded in the branchlets.

Habitat. Southern and western shores of England; west of Scotland; Ireland generally. On rocks, &c. between tide-marks and in deeper water. Not uncommon.

Now *Lomentaria kaliformis*. Variable in luxuriance and general appearance, but always retaining its characteristic growth, more or less. For varieties see Plate XXXIV. Fig. 151; and Fig. 153 for another *Chylocladia*.

144

144



Laurencia tenuissima, Gray.



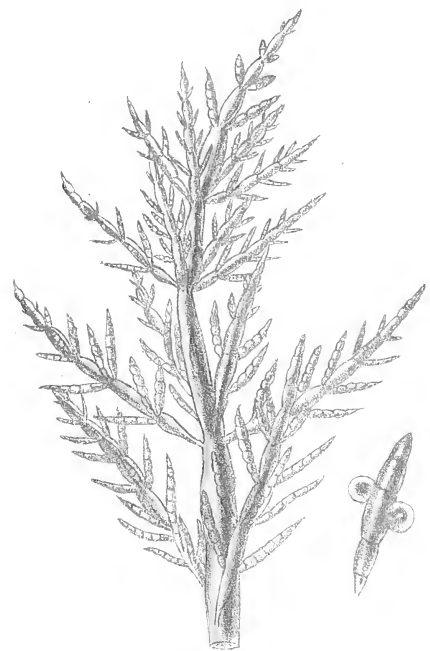
Laurencia dasyphylla, Gray.

145

146



Chyloclelea ovata Hook.



Chyloclelea kalifornica Hook.

PLATE XXXIII.

Fig. 147. CHYLOCLADIA ARTICULATA.

Colour. A fine pinky red.

Substance. Soft, membranaceous ; somewhat gelatinous.

Character of Frond. Bushy ; much branched ; tufted ; tubular ; strongly constricted throughout at intervals, into longish, inflated joints. Main stems forked (*dichotomous*), bearing branches which issue from the constrictions on each side, or all round the stem (*whorled*). These branches also forked, and bearing from their constrictions opposite or *whorled* branchlets ; often very much crowded above.

Measurement. From 1 to 6, or occasionally 12 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in bluntly conical *capsules* ; external :
2. *Tetraspores* imbedded in the joints of the branchlets.

Habitat. Our coasts generally. On rocks, &c. between tide-marks. Common.

For other *Chylocladias*, see Plates XXXI, XXXII, and XXXIV.

Fig. 148. CORALLINA OFFICINALIS.

Colour. Purplish or lilac when recent ; varying to pinky, or brick-dust red ; fading to milk-white.

Substance. Hard and stony, like coral ; but flexible at the joints ; exceedingly brittle, when dry.

Character of Frond. Bushy ; tufted ; much branched ; in thick clumsy joints. Stems simple, bearing stiff, straight, upright, mostly opposite branches of sometimes very unequal lengths. Branches once or twice re-branched. Branchlets exactly opposite, and of regular lengths, giving a feathery outline to each division. Lower joints cylindrical, as long as broad ; upper shorter, somewhat wedge-shaped but rounded, and with blunt shoulders. Branchlets cylindrical, with blunt or knobbed tips.

Measurement. From 2 to 6 inches high, rising from a wide-spread, lilac-red crest.

Fructification. Only one kind known. Clustered *strings of spores* in urn-shaped or oval *capsules* ; external ; at the tips of the branches or scattered on the sides.

Habitat. Our coasts generally. On rocks between tide-marks, generally in rock-pools, fringing and covering both sides and bottom.

Varying very much in the luxuriance and even character of its branching ; most luxuriant in deep water. The structure is that of a vegetable growth incrusting with lime.

Fig. 149. CORALLINA SQUAMATA.

Colour. Purplish or lilac when recent; varying to pinky or brick-dust red, fading to green or milk-white.

Substance. Hard and limy, like coral; but flexible at the joints; exceedingly brittle, when dry.

Character of Frond. Bushy; tufted; much branched in thick clumsy joints. Stems simple, bearing stiff, straight, upright, mostly opposite branches of sometimes very unequal lengths. Branches once or twice re-branched. Branchlets exactly opposite, and of regular lengths, giving a feathery outline to each division. Lower joints cylindrical, scarcely longer than their breadth; upper, twice as long; flatter, wider, and more distinctly wedge-shaped than those of *C. officinalis*; with sharp, prominent shoulders. Branchlets very slender, with acute tips.

Measurement. From 1 to 6 inches high; rising from an expanded lilac-red crust.

Fructification. Only one kind known. Clustered *strings of spores* in urn-shaped or oval *capsules*; external; at the tips of the branches, or scattered on the sides.

Habitat. South coast of England and west of Ireland. On submarine rocks at the extremity of low-water mark. Not common.

Closely resembling *C. officinalis*, but they may be distinguished by a careful observation of the upper joints of the stem and branches; which in *C. squamata* are "broad and flat, with unusually sharp angles."

Fig. 150. DELESSERIA ANGUSTISSIMA.

Colour. Dark-red.

Substance. Firm; but membranaceous.

Character of Frond. Thread-like (*filamentous*); tufted; excessively branched. Stems cylindrical below, compressed above. Branching very irregular; partly forked (*dichotomous*); partly alternate. Branches at one level throughout (*distichous*); of unequal lengths; much divided above, and furnished with numerous forked branchlets.

Measurement. From 4 to 8 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in globose *capsules*; imbedded in the tips of the branches, or in small side-branchlets. 2. *Tetraspores* in groups (*sori*) either in the swollen tips or in narrow side-branchlets.

Habitat. North of Scotland and east of England. (Filey.) Parasitical on the stems of *Laminaria digitata*.

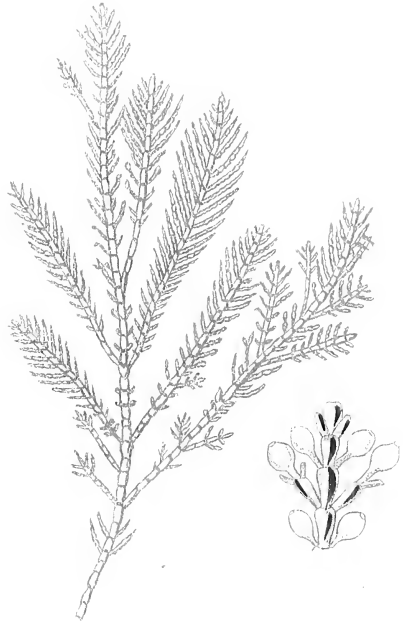
Those who have had the opportunity of seeing much of this plant cannot fail to accept Dr. Harvey's judgment, that it is but an extremely narrow variety of *Delesseria alata*. At Filey the most strikingly intermediate specimens are to be found.

147



Chylocladia articulata, Grœv.

148



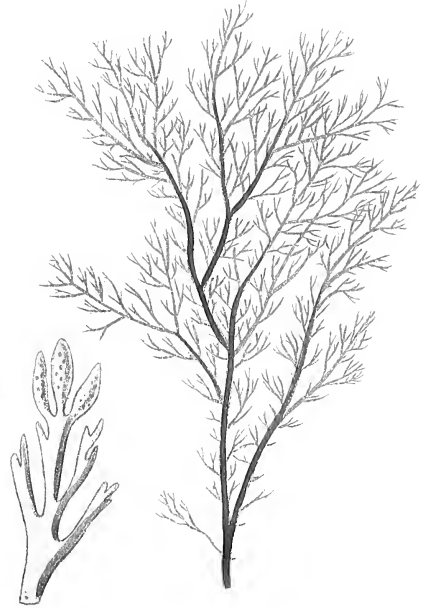
Corallina officinalis, Linn.

149



Corallina squamata, Park.

150



Delesseria angustissima, Griff.

PLATE XXXIV.

Fig. 151. CHYLOCLADIA KALIFORMIS.

These are but varieties of the plant represented in Plate XXXII. Fig. 146. The one to the left with branches wide-spread, and mostly opposite, is *β. patens*. The other clothed with *quadrifurios* horizontal branchlets, is *γ. squarrosa*. (See under Fig. 146.)

Fig. 152. DASYA ARBUSCULA.

Colour. Pale reddish-brown; sometimes deep red.

Substance. Soft and tender.

Character of Frond. A very delicate little bush; tufted. Stems as thick as a fine hog's bristle; much and irregularly branched; sometimes forked (*dichotomous*), sometimes furnished with wavy, more or less spreading, alternate branches, which are several times re-branched, and all densely clothed with slender fringing branchlets. Branchlets short, forked, horizontally set, giving the stems a roundish bottle-brush appearance; crowded at the tips as in *D. ocellata*.

Measurement. From 2 to 4 inches high.

Fructification. Of two kinds. 1. Clustered *spores* in ovate *capsules*, which have a long cylindrical mouth; external, on the branchlets. 2. *Tetraspores* in pointed oblong *stichidia*.

Habitat. South of England (Plymouth, &c.). Ireland and Scotland. Very fine at Bantry. On rocks at the verge of low-water mark. Not common.

A more slender variety, with more regularly forked branching, is obtained by dredging. Alike as this pretty little plant and *Dasya ocellata* are to each other in general look, they may easily be distinguished on careful examination. The stems of *D. ocellata* are usually quite simple, and in shape like a peacock's feather; or else slightly branched in the upper part; while those of *D. arbuscula* are profusely branched either in a forked manner, or with alternate branches which are more than once re-branched. The fringing branchlets are common to both species, but those of *D. arbuscula* are not above one-sixth of an inch in length.

Fig. 153. CHYLOCLADIA PARVULA.

Colour. A fine but fugitive pinky-red.

Substance. Soft and somewhat gelatinous.

Character of Frond. Slender; tubular; constricted at intervals into somewhat inflated joints; much branched and entangled. Branches irregular; alternate, or *secund*; of various lengths; with or without scattered branchlets, which taper slightly to the base. Joint-contractions as long as broad. Root a mass of fibres.

Measurement. Two or 3 inches long.

Fructification. Of two kinds. 1. Masses of *spores* in conical *capsules*; external; seated (*sessile*) on the branchlets. 2. *Tetraspores*; imbedded in the same.

Habitat. South of England. Not uncommon on the shores of Ireland and west of Scotland.

Now *Champia paroula*.

Fig. 154. JANIA RUBENS.

Colour. Lilac when recent; changing to pinky or brick-dust red; fading to green or milk-white:

Substance. Hard and stony, like coral; but flexible at the joints. Exceedingly brittle, when dry.

Character of Frond. Dense tufts of slender branches; their tips trimmed to one level (*fastigate*). Branching forked (*dichotomous*). Branches erect or spreading; gradually tapering upwards; cylindrical; jointed. Joints at the base very short; the upper ones gradually longer.

Measurement. From $\frac{1}{2}$ to 1 or 2 inches high.

Fructification. Only one kind known. Clustered *strings of spores* in urn-shaped *capsules*; external, the last joint of a branchlet being transformed into one; generally with a very slender branchlet springing from each shoulder, like horns, or the feelers (*antennæ*) of a butterfly.

Habitat. Our coasts towards the south. Parasitical on the smaller algæ between tide-marks. Common.

Fig. 155. JANIA CORNICULATA.

Colour. As in *Jania rubens*.

Substance. As in *Jania rubens*.

Character of Frond. As in *Jania rubens* with respect to general appearance and branching, but no further. In *J. corniculata* the joints of the principal branches are compressed and wedge-shaped, tapering to the base; the shoulders sharp and prominent, and often prolonged into a pointed horn-like branchlet (not figured in the Plate). Last branchlets cylindrical; joints of the principal branches from two to three times as long as broad; of the last branchlets very short.

Measurement. One or 2 inches high.

Fructification. As in *Jania rubens*.

Habitat. Southern shores of England and Ireland. Isle of Wight; Jersey, &c. Parasitic on the lesser algæ. Not uncommon.

Fig. 156. MELOBESIA CALCAREA.

Colour. When fresh, deep blood-red; soon passing into brick-dust colour; fading to milk-white.

Substance. Hard, stony, and limy; solid.

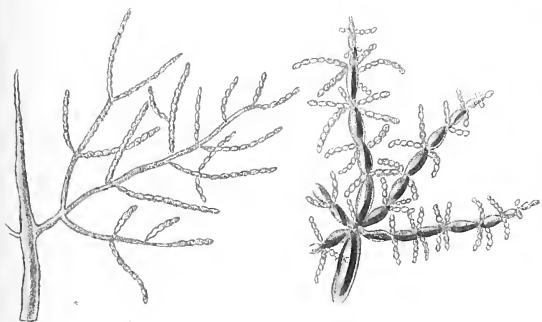
Character of Frond. Loose, irregular-shaped lumps, very much branched; like an old stunted tree in miniature. Main branches forked (*dichotomous*), two sometimes uniting in one as they grow (*anastomising*). Branchlets standing out in all directions; simple; forked; or three-pronged.

Measurement. From 1 to $2\frac{1}{2}$ inches high.

Fructification. Only one kind known. Clustered *strings of spores* in round, but rather depressed *capsules*, scattered about the frond.

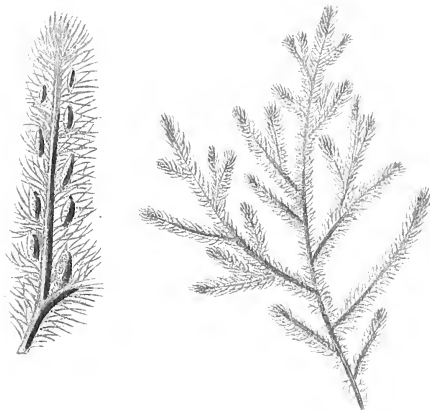
Habitat. South of England and west of Scotland and Ireland. On shingly or sandy shores in from five to fifteen fathoms' water.

151



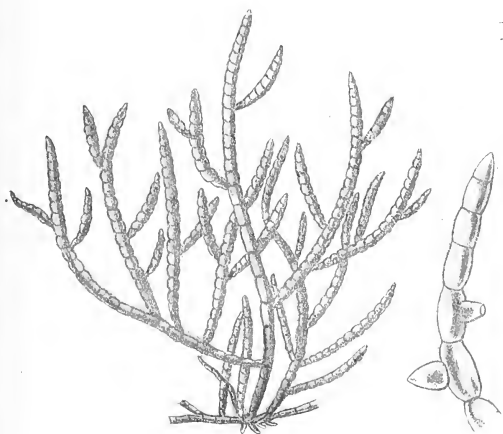
Chylocladia kalifornica, Hook.

152



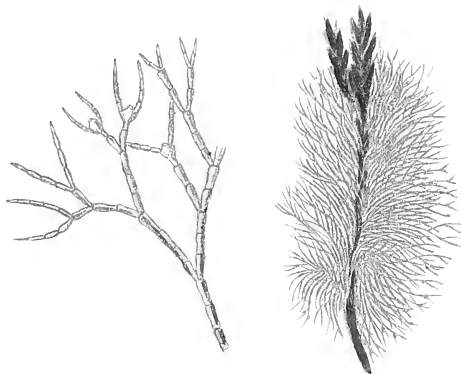
Dasya arbuscula, Ag.

153



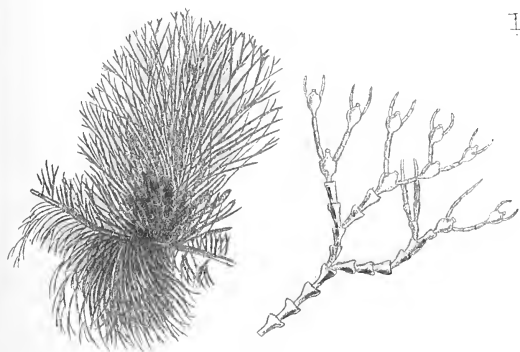
Chylocladia parvula, Hook

154



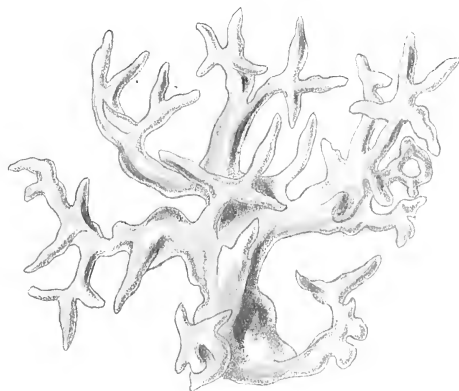
Jania rubens, Lamour.

155



Jania corniculata, Lamour.

156



Melchiesia calcarea, Ell. et Sol.

PLATE XXXV.

Fig. 157. MELOBESIA POLYMORPHA.

Colour. A dull purple; fading to red, yellow, greenish, or ash-coloured.

Substance. Hard, stony, limy, solid.

Character of Frond. Irregular lumps, attached to rocks by a narrow base. Of various shapes and sizes; sometimes furrowed like the kernel of a walnut; sometimes rising into short, clumsy, imperfectly developed branches. When fresh from the sea, covered with slime.

Measurement. From 1 to 3 inches high.

Fructification. Only one kind known. Clustered *strings of spores* in minute, round, but rather depressed *capsules*, seated on (*sessile*), and scattered over, the frond; numerous.

Habitat. South coasts of England, and west of Scotland and Ireland. On rocks, stones, and shells between tide-marks. Common.

Fig. 158. MELOBESIA FASCICULATA.

Colour. A dark lurid-purple; soon fading in the air.

Substance. Hard, limy, solid; less stony than *M. polymorpha*.

Character of Frond. Loose irregular lumps; roundish; furrowed; branched. Branches thick, short, clumsy, with broad, blunt, forked ends, somewhat hollowed out.

Measurement. From 1 to 3 inches across; about 2 high.

Fructification. Only one kind known. Clustered *strings of spores* in round, somewhat depressed *capsules*; seated on (*sessile*), and scattered over, the frond.

Habitat. Several places on our coasts. Chiefly south and west. Lying at the sandy bottom of the sea in from four to five fathoms' water.

Fig. 159. MELOBESIA AGARICIFORMIS.

Colour. Pale flesh-colour when fresh; fading to white.

Substance. Hard, limy, solid; but thin and brittle.

Character of Frond. A loose globular mass, composed of thin, leafy, semicircular expansions (like those of an old-fashioned cap-frill), twisted and curled into close folds; as the foliations spread, the central portion rots away, so that the mass is hollow.

Measurement. From 4 to 8 inches. The lump sometimes as large as a man's fist, or larger.

Fructification. Only one kind known. Clustered *strings of spores* in conical *capsules*; *sessile** on the frond.

Habitat. Roundstone Bay, Connemara. Lying on the sandy bottom of quiet bays in from two to three fathoms' water. Very rare.

* *Sessile*—unstalked—seated upon—as “every tub on its own bottom.” It is surely needless to persist longer in *translating* so simple a word?

It is to be remarked that a *spherical* (*i. e.* globose, *i. e.* round-as-a-ball) capsule, when so seated, sometimes becomes *hemi-spherical*; and this is the case with the globose capsules of the *Melobesias*, which are also often depressed on the surface.

Fig. 160. MELOBESIA LICHENOIDES.

Colour. Pale-lilac, or rather *mauve*.

Substance. Hard ; stony ; solid ; but thin and extremely brittle.

Character of Frond. A lichen-like expansion, composed of thin, circular, leafy plates, one above another ; attached to rocks by a central base. The foliations generally free at the margins ; often overlapping each other (*imbricated*).

Measurement. From 1 to 5 inches across.

Fructification. Only one kind known. Clustered *strings of spores* in large, conical, prominent *capsules* ; *sessile* on the frond.

Habitat. Cornwall and west of Ireland. On rocks and in tide-pools near low-water. Not uncommon.

Fig. 161. HILDENBRANTIA RUBRA.

Colour. Bright, or sometimes dull red.

Substance. Gristly-membranaceous.

Character of Frond. A thin, skin-like film, forming a circular or irregular red patch ; adhering by its under surface to the rock.

Measurement. Indefinite. From 1 to 6 inches, or thereabouts, in extent.

Fructification. Only one kind known. *Tetraspores* in round cavities, sunk in the frond.

Habitat. Our coasts generally. On smooth stones and pebbles between tide-marks. Common.

So thin that it looks merely like a red stain on the stone. When in fruit its surface is pitted with small disc-like depressions, underneath which lie the spore-cavities (*conceptacles*). The figure of the cavities gives more the appearance of raised capsules ; but *concavities* are difficult to represent.

Fig. 162. HAPALIDIUM PHYLLACTIDIUM.

Colour. White.

Substance. Thin ; limy ; brittle.

Character of Frond. Minute dot-like patches, which, under the microscope, prove to be composed of one or several thin fan-shaped, watery fronds.

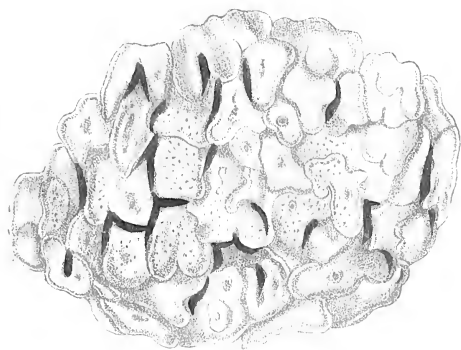
Measurement. The dots from $\frac{1}{12}$ to $\frac{1}{6}$ of an inch across.

Fructification. Unknown.

Habitat. Malahide, Dublin, and elsewhere. Parasitic on *Chrysiomenia clavellosa* and other small algae.

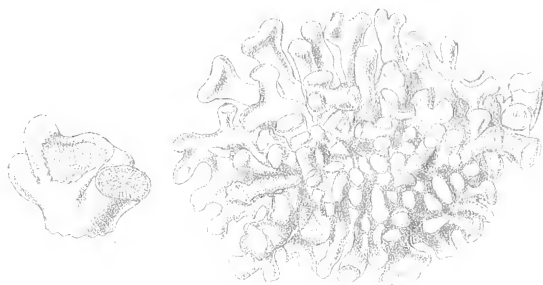
A very remarkable little plant, and said to be common ; but, if so, it wants looking for. It was, until lately, known as *Lithocystis Allmanni*. (See Harvey's *Manual of Br. Mar. Algæ*, 2d edition, p. 111 : 1849.) It is now (1862), by many, believed to be the young of a *Melobesia*.

157.



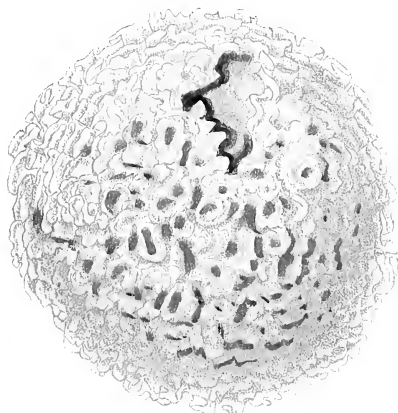
Melobesia polymorpha, Linn

158.



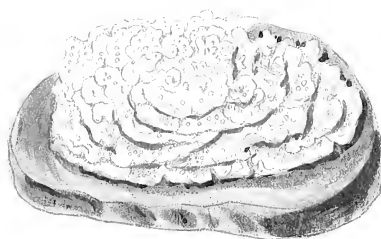
Melobesia fasciculata, Harv.

159.



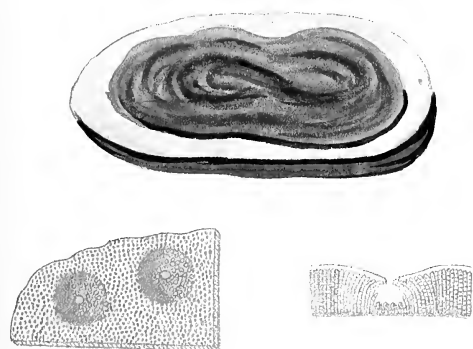
Melobesia agariciformis, Harv.

160.



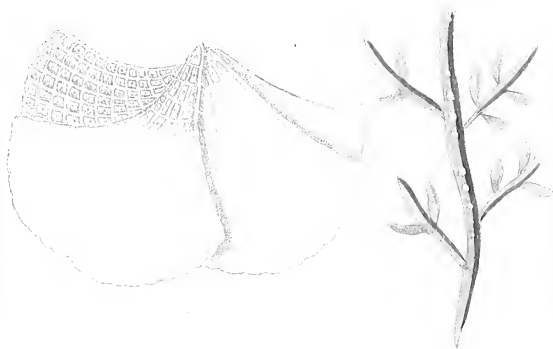
Melobesia lichenoidea, Berl.

161.



Hildenbrandtia rubra, Meneg.

162.



Hapalidium Phyllactidium, Kütz.

PLATE XXXVI.

Fig. 163. MELOBESIA MEMBRANACEA.

Colour. Pale-lilac (*mauve*); becoming white.

Substance. So thin as to be almost membranaceous, although limy; the colour of the sea-weed on which it grows, seen through.

Character of Frond. Minute, dot-like; parasitic; circular at first; several running together by degrees (*confluent*), forming irregular patches on the plant on which it grows.

Measurement. From $\frac{1}{24}$ to $\frac{1}{12}$ of an inch in diameter; patches $\frac{1}{2}$ an inch or more in extent.

Fructification. Only one kind known. Clustered *strings of spores* in round, but somewhat depressed *capsules*, with a hole at the top; *sessile* on the frond; usually one or two.

Habitat. Our coasts generally. On the leaves of *Zostera marina* (the sea-ribbon), *Phyllophora rubens*, *Chondrus crispus*, &c. Common.

The microscope shows the surface of this plant to be beautifully tessellated (something like that of *Hapalidium phyllactidium*, which, as before stated, is now suspected to be only a very young state of one of the *Melobesia* family). More or less all the *Melobesias* have the same appearance.

Fig. 164. MELOBESIA FARINOSA.

Colour. Very pallid *mauve*; becoming white.

Substance. Thin, but thicker than *M. membranacea*, limy, the colour of the sea-weed on which it grows, not seen through.

Character of Frond. Very like *M. membranacea*, only larger and thicker, and of more uncertain outline; forming irregular patches on the plant on which it grows.

Measurement. From $\frac{1}{4}$ to an inch across.

Fructification. Only one kind known. Clustered *strings of spores* in round prominent *capsules*, with a hole at the top; *sessile* on the frond; usually two or three.

Habitat. Our coasts generally. On various algæ. Common.

Fig. 165. MELOBESIA VERRUCATA.

Colour. Very pallid *mauve*; becoming white.

Substance. Thin; limy; but thicker than either of the preceding.

Character of Frond. An expanded crust; uncertain in outline; forming irregular patches on the plant on which it grows.

Measurement. Patches from $\frac{1}{4}$ to an inch or more in extent.

Fructification. Only one kind known. Clustered *strings of spores* in innumerable small, round, pimply *capsules*, with a hole at the top; seated (*sessile*) on the frond.

Habitat. Our coasts generally; chiefly south and west. On *Phyllophora rubens*.

"Looks like a still more advanced stage of *M. membranacea*." (HARVEY.)

Fig. 166. MELOBESIA PUSTULATA.

Colour. Dull-purple, or green.

Substance. Thickish; limy; smooth.

Character of Frond. An expanded crust; uncertain in outline; oblong or divided; forming irregular patches on the plant on which it grows; the largest form of the sort.

Measurement. The patches 1 or 3 inches in extent.

Fructification. Only one kind known. Clustered *strings of spores* in numerous large, rather prominent, round, conical *capsules*, with a hole at the top; *sessile* on the frond.

Habitat. Our coasts generally; chiefly south and west. On *Phyllophora rubens* and other algæ. Common.

Dr. Harvey has little doubt that the four last-described *Melobesias* are but differently advanced developments of one species. Dr. Johnston went further still, considering them all but imperfect developments of *Corallina officinalis*; whose base, it will be remembered, is a thin, circular, limy patch of a purplish or pinky colour.

Fig. 167. STENOGRAMME INTERRUPTA.

Colour. Rose-red; very clear and pinky.

Substance. Membranaceous; more rigid below than above.

Character of Frond. Flat, fan-shaped or semicircular in general outline. Rising from a short stalk; deeply cut from the base into narrow slips (*laciniae*); or the lower portion undivided, the upper slit. (See figure.) *Laciniae* repeatedly forked (*dichotomous*) slightly widening upwards; their tips blunt. Root a disc.

Measurement. From 3 to 5 inches long; and about the same in width across the whole frond.

Fructification. Of two kinds. 1. Minute *spores* immersed in the frond in dark, narrow, nerve-like lines; running through the centre of each *lacinia* like a midrib. 2. *Tetraspores* in dark groups (*soræ*) scattered on the surface. Very rare in Britain.

Habitat. Plymouth and Cork harbours, and a few stations on the south coast of England. Washed ashore or dredged. Attached to stones in from five to ten fathoms' water. Very rare.

Fig. 168. GRACILARIA ERECTA.

Colour. Pale or full red.

Substance. Elastic; rigid; not adhering to paper.

Character of Frond. Stiff, upright, tufted; slightly branched. Stems cylindrical, slender; simple, or once or twice forked (*dichotomous*). No branchlets, or very rarely. Fruiting in winter.

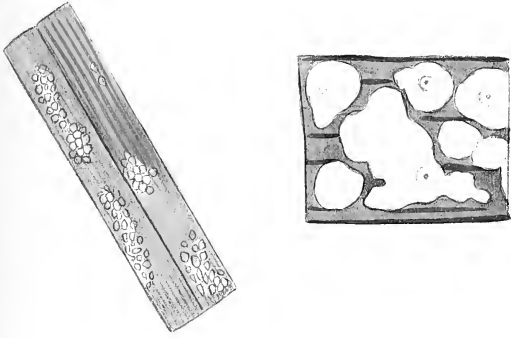
Measurement. One or 2 inches high.

Fructification. Of two kinds. 1. A mass of minute spores in globose *capsules* clustered together; external. 2. *Tetraspores*, contained in little pod-like branchlets at the ends of the branches.

Habitat. South coast of England. The flat bottoms of shallow rock-pools, near low-water mark. Also in from four to five fathoms' water. Very rare.

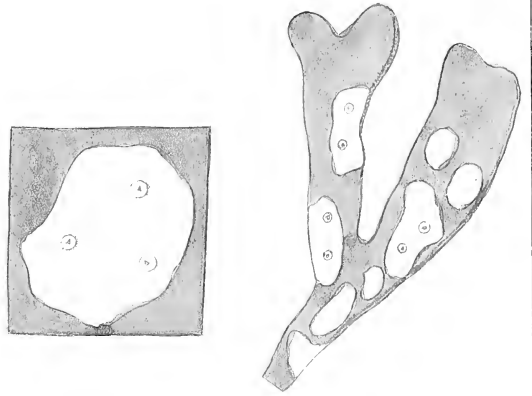
"When in perfect fructification this little plant is easily recognised," says Dr. Harvey, "the clustered tubercles and lanceolate, pod-like tips being both very strikingly characteristic."

163



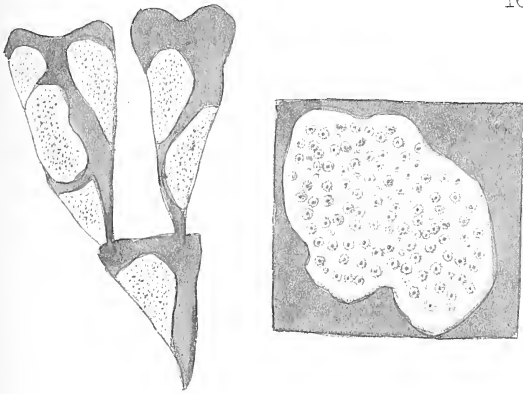
Melobesia membranacea, Lamour.

164



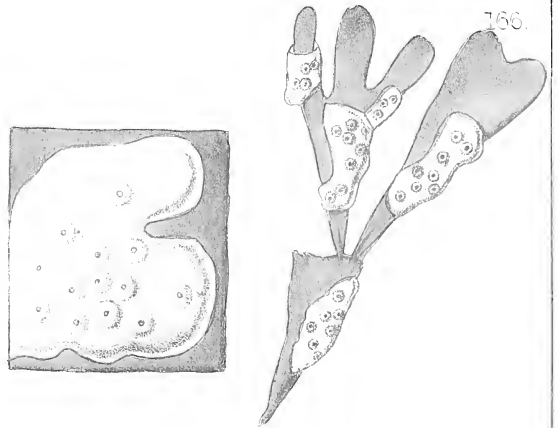
Melobesia farinosa, Lamour.

165



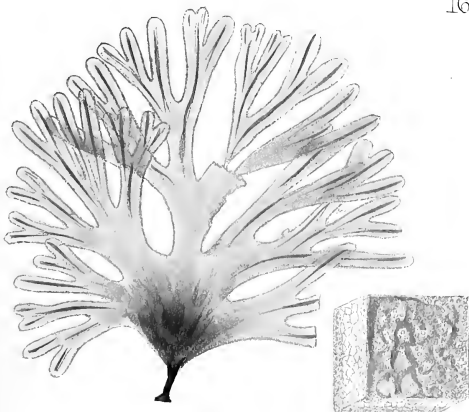
Melobesia verrucata, Lamour.

166



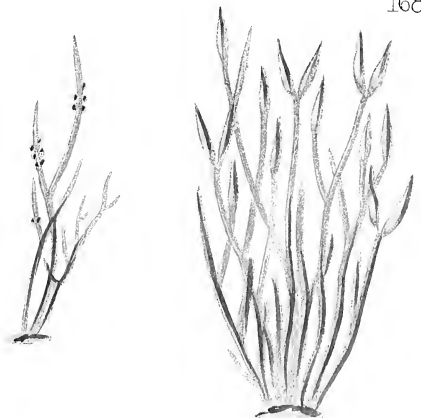
Melobesia pustulata, Lamour.

167



Stenogramme interrupta, Mont

168



Gracilaria erecta, Grv.

PLATE XXXVII.

Fig. 169. DELESSERIA SANGUINEA.

Colour. Blood-red so soon after exposure that it is generally picked up that colour; but when perfectly fresh a clear transparent moroon. Becoming brilliant after an hour or two's pressure, and retaining its fine cactus-hue in the herbarium, quite unchanged by years. The plate represents a plant which, having been picked up red, has faded, under pressure, to pink.

Substance. Delicately membranaceous all but the stem and midribs, which are firmly elastic.

Character of Frond. Stem and branches bearing strongly midribbed, distinctly veined leaves. Stem thick, solid, cylindrical; simple or slightly branched; darker than the leaves. Leaves oblong, more or less pointed; sometimes obtuse; their margins curled, but quite whole (*entire*). Midribs and side-veins prominent; the former occasionally furnished with leaflets. (See figure.) Fruiting in winter. Root a disc.

Measurement. Leaves from 2 to 8 inches long; from 1 to 6 wide. Frond varying from a few inches to a foot in height.

Fructification. Of two kinds; external. 1. A mass of *spores* in globose, stalked *capsules*; borne in winter on the skeleton midribs of the summer's leaves from which the membrane has died away; and which thus become the stems of the next year's plant. 2. *Tetraspores* in small, special, stalked leaflets, fringing the skeleton midribs.

Habitat. Our coasts generally. On rocks, *Laminaria* stems, and in pools, at or near low-water mark, and deeper. Common.

This charming plant, of whose beauty the eye never wearies, is happily not rare. It should be looked for in the early summer, before it is torn or disfigured by zoophytes. The cruel necessities of science have caused it to change its name, and by no means for the better. The old friend must be introduced to its admirers now as "*WORMSKIOLDA sanguinea*."

Fig. 170. DELESSERIA SINUOSA.

Colour. A deep fine red; purplish when dry. Much duller at all times than the preceding.

Substance. Delicately membranaceous, all but the stems and midribs, which are elastic and firm, though slender.

Character of Frond. Stem and branches, bearing distinctly midribbed and veined leaves. Stem slender, cylindrical, once or twice branched. Leaves oblong at first; spreading irregularly afterwards; deeply and variously cut in (*pinnatifid*); often like an oak-leaf; sometimes more regularly, as in the figure. (See figure.) Margins toothed or jagged. Midribs occasionally producing leaflets, as in *D. sanguinea*.

Measurement. From a few inches to a foot high. Leaves of every variety of size.

Fructification. Of two kinds. 1. A mass of *spores* in globose *capsules*, imbedded in the midribs of the leaves. 2. *Tetraspores* in minute leaflets fringing the margins and midribs.

Habitat. Our coasts generally, but preferring the north. On the stems of *Lam. digitata*, and on various substances in deep water. Not uncommon.

A more variable plant in general appearance than the preceding. When old, and a set of skeleton branches with a few stunted leaves upon them, it can hardly be recognised. A broad-leaved specimen is a very beautiful object.

Fig. 171. DELESSERIA ALATA.

Colour. A deep red.

Substance. Side-wings membranaceous; midribs elastic and firm.

Character of Frond. Stems and branches winged with a delicate membrane on each side; nowhere furnished with distinct leaves. But in luxuriant specimens, the winged membrane has side-veins, similar to those of a leaf. Stem compressed; several times forked (*dichotomous*); or excessively but irregularly branched. Margins whole (*entire*). Tips often cleft, and overlapping.

Measurement. Frond from 3 to 8 inches high. Branches from $\frac{1}{12}$ to $\frac{1}{8}$ of an inch wide.

Fructification. Of two kinds. 1. A mass of *spores* in globose *capsules*, imbedded in (but prominent above) the midribs; towards the extremity of the branchlets. 2. *Tetraspores* imbedded either in minute leaflets springing from the midrib either at or near the tips, or in the tips themselves. Leaflets springing from the midribs.

Habitat. Our coasts generally. On rocks; the stems of *Laminaria digitata*, and other large algæ, and in from four to ten fathoms water. Common.

So different in the width of the winged membrane that the young student may easily be led to suppose he has got hold of a different species in the different varieties. Sometimes from the abundance of leaflets growing out of the midribs the whole upper part of the frond is thick and bushy. Refer back to Plate XXXIII. Fig. 150, for *Delesseria angustissima*, which is suspected to be only a narrow variety of *D. alata*.

Fig. 172. DELESSERIA HYPOGLOSSUM.

Colour. A fine pinky-red, soon given out in fresh-water.

Substance. Delicately membranaceous.

Character of Frond. Composed entirely of leaves growing from leaves; the younger from the midribs of the older, in several series; so that the *tout ensemble* in full-grown specimens is globose. Leaves linear-lanceolate, tapering at each end; margins whole (*entire*). Midribs distinct; side-veins faintly marked; transparent. Branchlets springing from the midribs.

Measurement. Most variable. Leaves sometimes $\frac{1}{4}$ of an inch wide; sometimes $\frac{1}{2}$ an inch. Fronds from an inch to $\frac{1}{2}$ a foot high.

Fructification. Of two kinds. 1. A mass of *spores* in globose *capsules*, immersed in (but prominent above) the midribs of the leaflets. 2. *Tetraspores* forming linear groups on each side of the midrib.

Habitat. Our shores generally. On rocks and algæ. Not uncommon, though rare in Scotland.

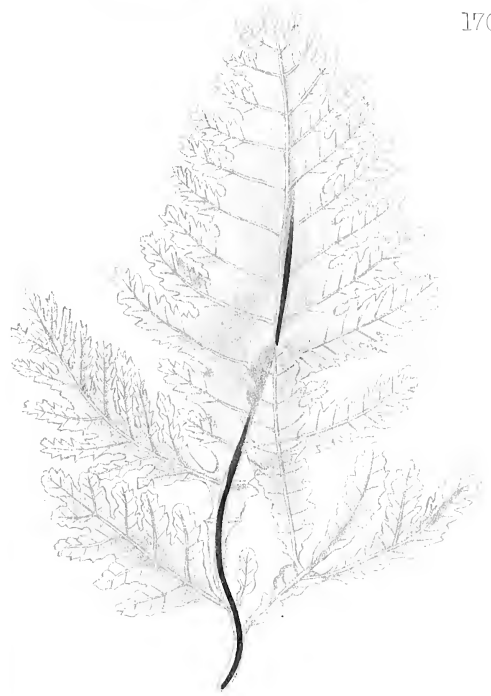
At Cushendall, Co. Antrim, the frond grows from three to four feet long. But this is a very unusual size. Even in the narrowest varieties, however, the character of the species is preserved; *i. e.* the growth of the leaves from the midribs of others; a peculiarity the figure does not make sufficiently clear, as the leaflets there have the appearance of springing from the margins of the preceding set, which is not the case. *D. hypoglossum* cannot be confounded with any other plant, with the exception of *Delesseria ruscifolia*; but *D. hypoglossum* is of a brighter colour; thinner; and its leaves are longer and narrower in proportion, and pointed instead of obtuse at the tips. For another *Delesseria* see Plate XL. Fig. 182, where the characteristic growth of that species and the present is better given.

169.



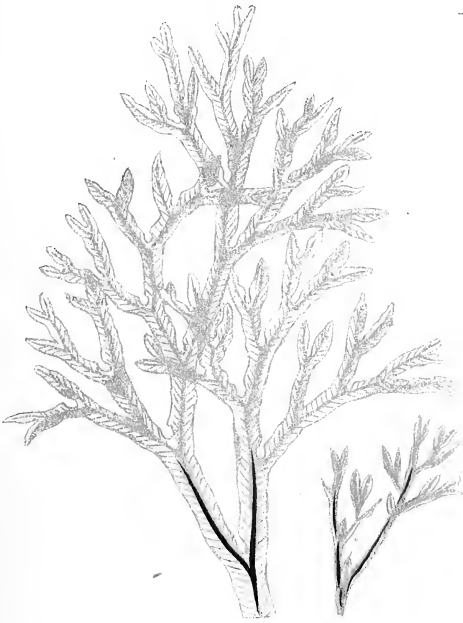
Delesseria sanguinea, Lamour

170.



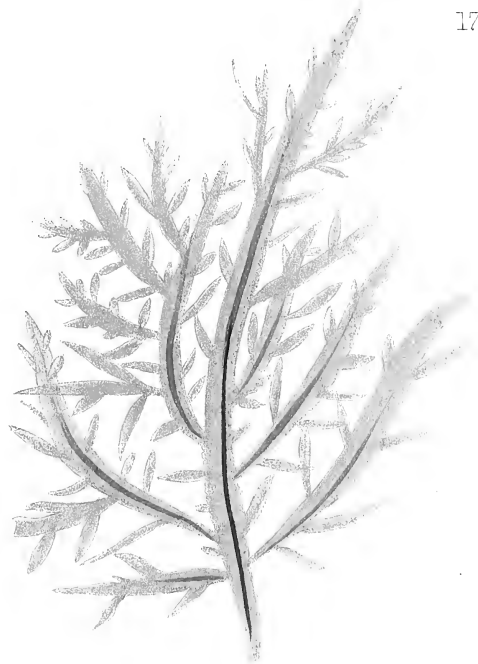
Delesseria sinuata, Lamour

171.



Delesseria alata, Lamour

172.



Delesseria hypoglossum, Ag

PLATE XXXVIII.

Figs. 173 & 174. NITOPHYLLUM PUNCTATUM.

Colour. Bright pink.

Substance. Delicately membranaceous.

Character of Frond. A thin, flat, ribless expansion; unstalked (*sessile*); irregular in outline, but always inclined to wedge-shape; variously slit and divided. Sometimes nearly simple, with a few forked (*dichotomous*) divisions (*laciniæ*) above; or fringing the margins also. Sometimes narrow, and repeatedly forked from the base. (See Fig. 174; upper form.) Glossy when dried. Unmarked by veiny lines.

Measurement. From 4 to 12 inches long, and about as broad. At Cushendall, N. Ireland, 5 feet long by 3 wide!

Fructification. Of two kinds. 1. Clustered *spores* in small, globose, *capsules*; immersed in, and thickly scattered over, the surface. 2. *Tetraspores* in large more or less oval groups (*sori*), scattered, or confined to a central portion.

Habitat. Several stations on our coasts. West of Scotland. Finest in Ireland. Attached to algae in pools at low-water mark, and in deeper water.

Dr. Harvey has here collected under one name several plants which have been accounted species, but which he has satisfied himself agree in certain important distinctive characters. Amateurs may be guided by the bright, light, pink colour, extremely thin substance, glossiness when dry, and entire absence of veiny lines, to a recognition of this plant under its many forms.

Fig. 175. NITOPHYLLUM HILLIÆ.

Colour. A fine rose-red, which turns to orange in fresh water.

Substance. Membranaceous and tender, but thickish. Mrs. Griffiths said, "resembling soft kid-leather."

Character of Frond. A flat, ribless expansion; rising from a short stalk; of round but irregular outline; more or less deeply slit into oblong, broad, rounded divisions (*laciniæ*). Margins smooth and even; or occasionally slightly waved. Obscure veins rising from the base, and sometimes spreading faintly upwards.

Measurement. From 4 to 8 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in large globose *capsules*; immersed in, and scattered over, the surface. 2. *Tetraspores* in extremely minute, dot-like groups (*sori*), scattered over the upper part of the divisions (*laciniæ*).

Habitat. South of England. On the shady sides of deep tidal-pools near low-water mark. Rare.

Fig. 176. NITOPHYLLUM GMELINI.

Colour. Purplish-red.

Substance. Membranaceous; but crisp and somewhat rigid when first gathered.

Character of Frond. A flat, ribless expansion, rising from a short stalk; of broadly fan-shaped or round outline; more or less deeply slit and divided. Divisions (*laciniæ*) broadly wedge-shaped, waved or curled. Margins smooth and even. Obscure veins rising from the base and sometimes spreading faintly upwards.

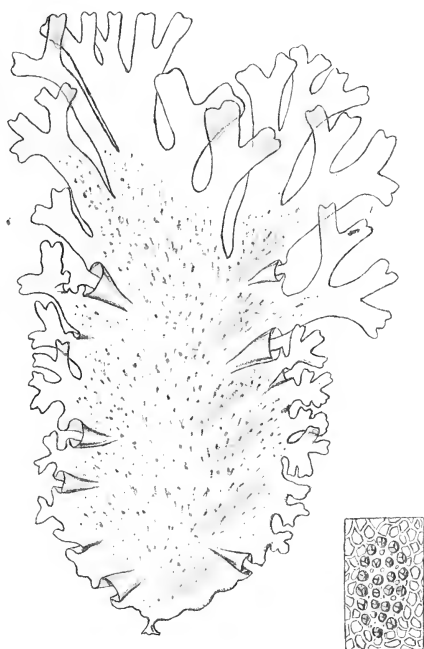
Measurement. From 2 to 4 inches high, and as wide or wider. In Irish specimens 6 inches.

Fructification. Of two kinds. 1. Clustered *spores* in largish, globose *capsules*; scattered over the surface. 2. *Tetraspores* in long, line-like groups (*sori*) along the margins only.

Habitat. South of England. Plymouth, fine. Ireland. On rocks and large algæ, near low-water mark.

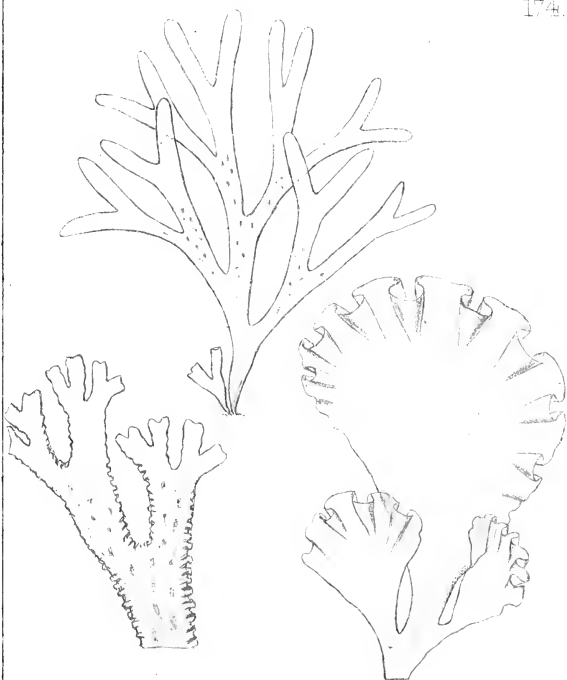
When fresh, always to be recognised by its crisp, rigid substance.

173.



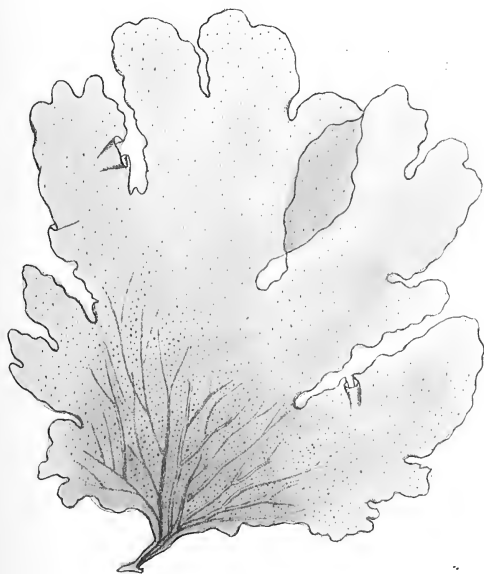
Nitophyllum punctatum, Grev

174.



Nitophyllum punctatum, var.

175.



Nitophyllum Hillæ, Grev.

176.



Nitophyllum Gimelini, Grev.

PLATE XXXIX.

Fig. 177. NITOPHYLLUM LACERATUM.

Colour. Dull-purplish, or brownish-red.

Substance. Membranaceous. Extremely thin; cracking when dry.

Character of Frond. A flat, ribless expansion; unstalked (*sessile*); much slit and divided in a forked manner (*dichotomously*). The divisions (*lacinae*) sometimes narrow, like those of the narrow variety of *N. punctatum* (see Plate XXXVIII. Fig. 174, the upper form); sometimes as broad as those of *N. Gmelina* (Plate XXXVIII. Fig. 176); generally obtuse; margins either smooth and even or curled; or fringed with small leafy frondlets. Distinctly marked veins rising from the base and spreading upwards.

Measurement. From 2 to 10 inches long.

Fructification. Of two kinds. 1. Clustered *spores* in globose *capsules*; scattered. 2. *Tetra-spores* in oblong groups (*sori*) disposed along the margin, or in the fringing leaflets.

Habitat. Our coasts generally. Near low-water mark. Common.

The only *Nitophyllum* which reflects prismatic colours in the water. A variety has all the tips of the divisions turned in like hooks, and clings by them to the small algæ near. For other *Nitophyllums* see Plate XL. Figs. 181 and 185.

Fig. 178. PLOCAMIUM COCCINEUM.

Colour. Bright pink-red; particularly after a short exposure.

Substance. Elastic, though thin; not easily tearing. Giving out a pleasant scent in fresh water.

Character of Frond. Flat, or nearly so; very narrow; tufted; excessively branched. Main stems irregularly divided; thickly set with alternate, spreading branches, which are furnished throughout with short-curved, pointed branchlets. Branchlets simple, or furnished on their inner face with a smaller set of short-curved, pointed branchlets, arranged four in succession; these sometimes re-branchleted in a similar manner; the compound branchlets resembling little combs. All the frond at one level as if cut out of paper.

Measurement. From 2 to 12 inches long.

Fructification. Of two kinds; external. 1. A mass of minute *spores* in globose *capsules*, unstalked; borne on the edge of the upper branches. 2. *Tetraspores* in minute, simple, or branched *Stichidia*; on the branchlets.

Habitat. Our coasts generally. On rocks and the larger algæ, at low-water mark, or beyond. Common and abundant.

Fig. 179. RHODYMENIA LACINIATA.

Colour. The finest crimson.

Substance. Thickish ; soft ; elastic though membranaceous.

Character of Frond. A flat ribless expansion ; rising from a short flat stem ; of more or less fan-shaped outline ; deeply slit and divided in a forked manner (*dichotomously*). Divisions (*laciniæ*) wedge-shaped ; re-divided in the same way ; the tips obtuse ; often torn. When in fructification the margins curled or fringed with minute leafy frondlets ; these occasionally found on the surface.

Measurement. From 3 to 10 inches long.

Fructification. Of two kinds. 1. A mass of minute *spores* in globose *capsules*, immersed in the fringing or surface leaflets. 2. *Tetraspores* forming cloudy spots on the surface ; or along the margins, which are then smooth and entire.

Habitat. Our coasts generally. On rocks and stones, &c. in the sea ; rarely within tide-marks.

Now *Callophyllis laciniata*.

Fig. 180. RHODYMENIA PALMETTA.

Colour. Rose-red ; darker when dry.

Substance. Membranaceous, except the stems, which are elastic.

Character of Frond. A flat, ribless, fan-shaped, but often repeatedly forked expansion, rising from a longish, first cylindrical, then compressed stem, which is either simple or divided ; widening gradually upwards. Tufted. Divisions (*laciniæ*) narrow, with rounded spaces between, and very smooth, flat margins. Root, a broad disc, sometimes accompanied by fibres.

Measurement. Stems from $\frac{1}{2}$ inch to 2 inches long. Fronds 1 or 2 inches across.

Fructification. Of two kinds. 1. A mass of minute *spores* in globose prominent *capsules*, seated on the edges of the margins, or scattered ; generally towards the tips of the *laciniæ*. 2. *Tetraspores* forming deep red groups (*sori*) in the expanded tips.

Habitat. Our shores generally, but inclining southwards. On rocks, &c. near the verge of low-water mark, and lower. Not uncommon.

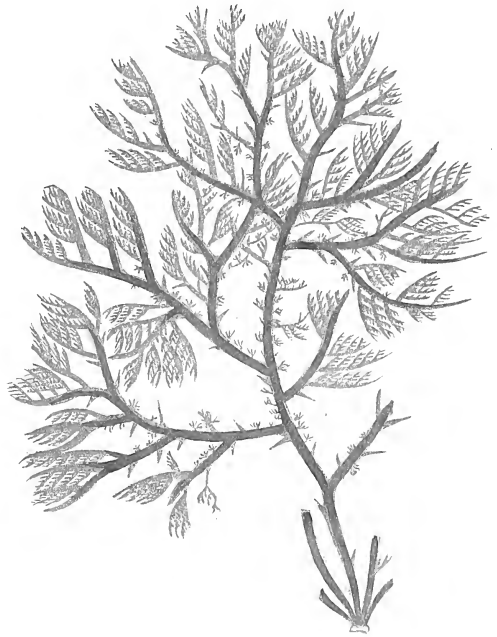
Varying greatly in general appearance ; but usually tolerably fan-shaped. Sometimes with only a short stem, sometimes with almost none ; or sometimes merely forked into two narrow leaves. (See figure.) Its pink-colour, crisp, yet delicate substance, and fructification, must be looked to as guides.

177.



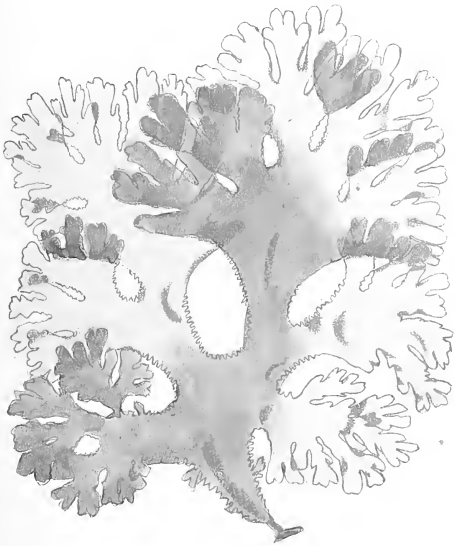
Nitophyllum laceratum, Grev.

178.



Plocamium coccineum, Lyngb.

179.



Rhodymenia lacinata, Grev.

180.



Rhodymenia Palmetta, Grev.

PLATE XL.

Fig. 181. NITOPHYLLUM VERSICOLOR.

Colour. When fresh, rose-red; turning to a beautiful golden orange in fresh water; even when wetted by a shower only.

Substance. Thick; membranaceous; soft; all but the stems, which are firmly elastic.

Character of Frond. A flat, ribless expansion, spreading suddenly from the top of a somewhat tuberous stem. General outline round. Slit into several deeply-cut, wedge-shaped divisions. Divisions (*laciniæ*) subdivided; many times slit above; their tips rounded, and generally thickened with hard, wart-like lumps. Margins smooth; or sometimes fringed with minute hair-like frondlets. Unmarked by veiny lines. Root unknown.

Measurement. From 1 to 3 inches high and across.

Fructification. Unknown.

Habitat. Ilfracombe. Youghal. Thrown ashore from deep water. Very rare.

Fig. 182. DELESSERIA RUSCIFOLIA.

Colour. A clear crimson, rather than pink.

Substance. Delicately membranaceous, but somewhat firmer than *D. hypoglossum*.

Character of Frond. Like that of *D. hypoglossum*, composed entirely of leaves growing from leaves; the younger from the midribs of the older. But in *D. ruscifolia*, the leaves are oblong with obtuse tips; and do not taper at the base.

Measurement. Seldom more than 2 inches high.

Fructification. Of two kinds. 1. A mass of spores in globose capsules; imbedded in, but prominent upon, the midribs of the leaves. 2. Tetraspores in groups (*sori*), forming oblong lines on each side the midribs.

Habitat. Our coasts generally. On rocks near low-water mark; or occasionally on algæ. Not common.

For other *Delesserias* refer back to Plate XXXIII. Fig. 150, and Plate XXXVII.

Fig. 183. RHODYMENIA BIFIDA.

Colour. A delicate rose-red or pink; sometimes dingy.

Substance. Delicately membranaceous; generally transparent.

Character of Frond. A flat, ribless expansion, deeply and repeatedly divided from the base. General outline round. Divisions (*laciniæ*) ribbon-like or wedge-shaped; many times forked (*dichotomous*); their *axils* rounded. Margins sometimes smooth (*entire*); sometimes fringed with minute, leafy, or hair-like frondlets; tips blunt or rounded.

Measurement. From 3 to 10 inches long. Width varying.

Fructification. Of two kinds. 1. A mass of spores in globose capsules; external; seated (*sessile*) on the margins; or rarely over the surface of the upper divisions. 2. Tetraspores forming cloudy spots in the upper divisions.

Habitat. Our coasts generally. On rocks and algæ at low-water mark, or beyond. Frequent.

Now *Rhodophyllis bifida*. The marginal capsules are a great clue to this plant.

Fig. 184. RHODYMENIA CRISTATA.

Colour. A rose-red ; becoming scarlet in fresh water.

Substance. Membranaceous.

Character of Frond. Flat ; narrow ; ribless ; repeatedly divided in a forked manner from the base. General outline fan-shaped or round (the figure fails to give this). Divisions widening upwards ; many times sub-divided ; lesser ones alternate, occasionally jagged at the ends.

Measurement. British specimens rarely above an inch high.

Fructification. Of two kinds. 1. A mass of *spores* in little spherical dark-red *capsules*, half the size of poppy-seed ; imbedded in the upper margins. 2. *Tetraspores* imbedded in the thickened and darkened tips.

Habitat. Orkney and Shetland Islands. Frith of Forth. Berwick-upon-Tweed, and a few more places in the north. Thrown ashore ; sometimes on the stems of *Lam. digitata*. Very rare indeed.

Now *Euthora cristata*. Six specimens were found at Berwick in 1853.

Fig. 185. NITOPHYLLUM BONNEMAISONIA.

Colour. Bright rose-red.

Substance. Delicately membranaceous. Very thin.

Character of Frond. A flat, ribless expansion, rising from a short stalk ; slit and deeply divided. General outline fan-shaped or round. Divisions broadly wedge-shaped ; about equal in length ; overlapping each other. Veins rising from the base, and spreading faintly upwards.

Measurement. From 2 to 4 inches high, and about as broad.

Fructification. Of two kinds. 1. A mass of *spores* in largish round *capsules*, scattered over the surface. 2. *Tetraspores* in roundish groups (*sori*) ; scattered over the surface.

Habitat. Orkney, Bute, Ilfracombe, Torquay, Miltown, Malbay, &c. On the stems of *Lam. digitata*. Rare.

Fig. 186. GRATELOUPIA FILICINA.

Colour. Dull pinkish-purple ; discolouring green.

Substance. Membranaceous.

Character of Frond. Flat ; narrow ; tufted ; wavyly branched. Stems simple or once forked ; tapering to each end ; naked at base ; above, set with long, opposite or alternate, wide-spreading, wavy, flat branches. Branches either simple or clothed in the upper part with branchlets ; all tapering to each end.

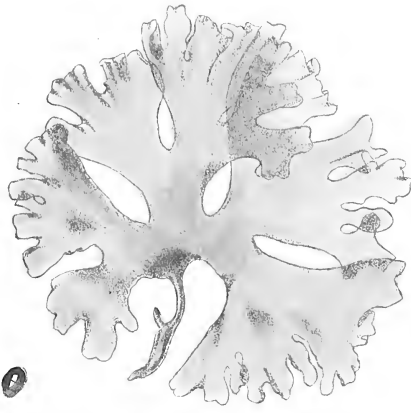
Measurement. British specimens seldom more than 2 inches high.

Fructification. Of two kinds. 1. *Spores* in minute globular *capsules* ; immersed in the substance of the branches. 2. *Tetraspores* imbedded in the branchlets.

Habitat. South of England. On submarine rocks at half-tide level ; frequently where a small streamlet runs into the sea. Very rare.

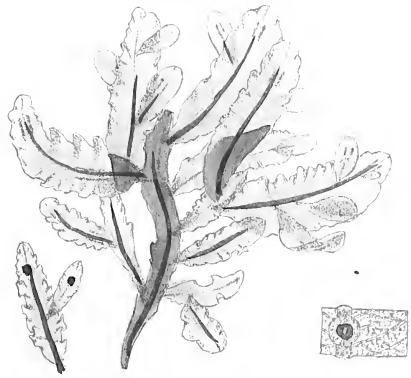
Very like some forms of *Gelidium corneum* ; but much softer.

181



Nitophyllum versicolor, Harv.

184



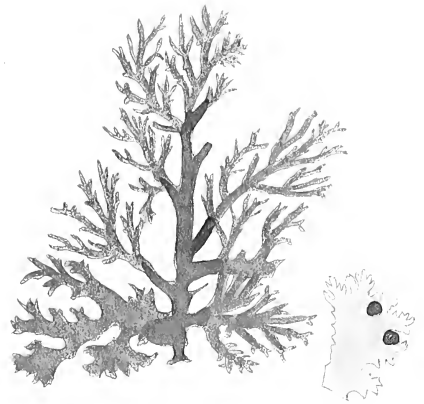
Delesseria ruscifolia, Lamour.

183



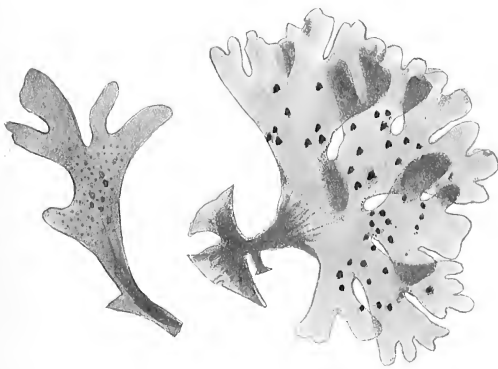
Rhodymenia bifida, Grev.

184



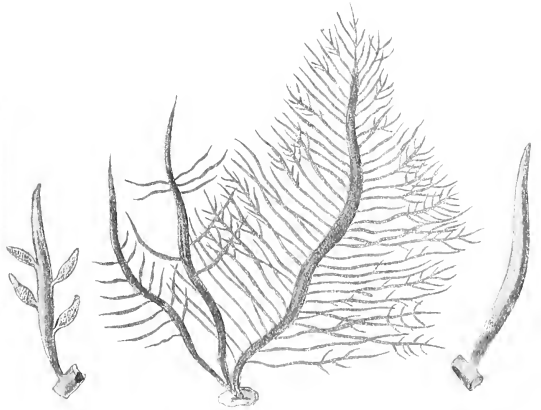
Rhodymenia cristata, Grev.

185



Nitophyllum Bornemaissoni, Grev.

186



Grateloupia filicina, Ag.

PLATE XLI.

Fig. 187. RHODYMENIA CILIATA.

Colour. A deep, full, more or less bright red ; becoming darker in drying.

Substance. Thick ; firm ; elastic ; quite crisp when fresh.

Character of Frond. A flat, ribless, leafy expansion ; rising from a very short stalk ; more or less broadly lanceolate, or once forked. Margins toothed ; or fringed with small, hair-like frondlets, some of which expand into leafy, lanceolate, or once-forked formations like the first ; while in others, both on the margin and surface, the capsular fruit is formed. Root fibrous. Fruiting in winter.

Measurement. From 2 to 8 inches long ; width of leaves varying from $\frac{1}{8}$ to $1\frac{1}{2}$ inches !

Fructification. Of two kinds. 1. A mass of *spores* in globose *capsules*, formed in the hair-like frondlets. 2. *Tetraspores* forming cloud-like patches ; dispersed over the surface.

Habitat. Our shores generally, except the extreme north-east. At Bridlington, but not at Filey. On rocks, &c. near low-water mark, and beyond. Frequent.

Now *Calliblepharis ciliata*. The tips of the hair-like frondlets in which the capsules form are turned aside by the swelling, and project sideways, like the bill of a bird. (See figure.)

Fig. 188. RHODYMENIA JUBATA.

Colour. A dull purplish, or pinkish-red.

Substance. Thick ; soft ; elastic ; limp.

Character of Frond. A flat, ribless, leafy expansion ; rising from a cylindrical stem ; narrow-lanceolate ; tapering to the base ; branched with leafy formations of the same character ; or sometimes with thread-shaped, fibre-like tendrils which spring both from the surface and margins ; fringed (like *R. ciliata*) with lesser hair-like frondlets, in which the fruit of both kinds is produced. Root fibrous. Fruiting in summer.

Measurement. From 1 to 8 inches long. Width varying almost incredibly.

Fructification. Of two kinds. 1. A mass of *spores* in hemi-spherical *capsules*, seated (*sessile*) on the fringing frondlets. 2. *Tetraspores* immersed in the same.

Habitat. South and west coasts. On the bottoms of tide-pools between tide-marks ; chiefly near low-water mark or among the roots of *L. digitata*. Frequent.

So various in width and size that it is very difficult to describe. Sometimes "filiform and entangled," and resembling *Gigartina acicularis*.

Figs. 189 & 190. RHODYMENIA PALMATA.

Colour. A dull purplish, or brownish-red.

Substance. When young, membranaceous ; afterwards leathery.

Character of Frond. A flat, ribless, broadly wedge-shaped expansion, much and irregularly divided into numerous, jagged, branching divisions ; or else repeatedly branched in a forked manner (*dichotomously*). Margins smooth (entire), or fringed with leaf-like formations. Root a disc.

Measurement. From 2 to 20 inches long.

Fructification. Only one kind known. *Tetraspores* forming cloud-like patches ; dispersed over the surface.

Habitat. Our coasts everywhere. On rocks and the stems of *Lam. digitata*, &c. Very common.

Fig. 189 represents the commonest form. In Fig. 190 we have, in the narrower specimen, Var. β *Sarniensis*; in the broader, Var. γ *sobolifera*. And many intermediate varieties occur. Dr. Harvey assures us, that once seen and *tasted*, no one can fail to recognise *R. palmata* again. It is the *Dulse* of the Scotch ; the *Dillisk* of the Irish ; and is eaten either raw or cooked, in many places, by the country people. At Miltown Malbay (W. Ireland), and elsewhere, they boil or stew it with a little dripping or butter, and pepper, into a savoury mess, like stewed cabbage.

187.



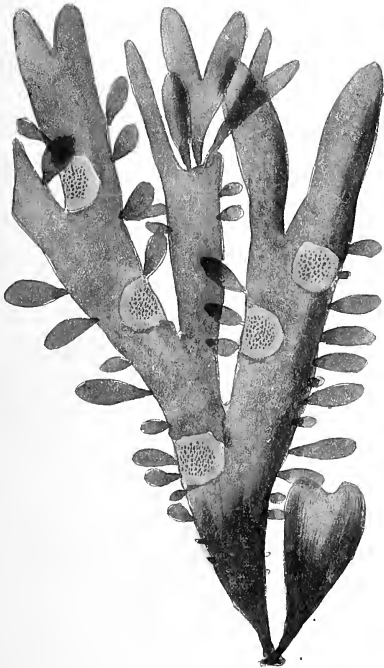
Rhodymenia ciliata, Grev.

188.



Rhodymenia jubata, Grev.

189.



Rhodymenia palmata, Grev.

190.



Rhodymenia palmata, var.

PLATE XLII.

Fig. 191. SPHÆROCOCCUS CORONOPIFOLIUS.

Colour. A fine scarlet-red ; darker in the main stems.

Substance. Gristly ; the stems very strong ; horny when dry.

Character of Frond. Compressed ; narrow ; very much branched ; wide-spreading, forming a rounded outline. Main stems thickened in the centre ; repeatedly divided, with a mixture of forked (*dichotomous*) and alternate branching. Branches several times re-branched in the same irregular way ; the margins of the upper ones generally fringed with minute, short, stalk-like, horizontally-set frondlets, in some of which the capsular fruit is formed. Last branchlets much and closely divided ; spreading ; with acute tips.

Measurement. From 6 to 12 inches long, or more.

Fructification. Only one kind known. A mass of *spores* in globose *capsules*, formed in the fringing frondlets ; the swelling turning the tips aside as in *Rhodymenia ciliata*.

Habitat. Southern and western shores of Great Britain and Ireland. Niton Bay, Isle of Wight, abundant. Isle of Man. Isle of Bute.

Fig. 192. GELIDIUM CARTILAGINEUM.

Colour. A fine dark-purple ; becoming scarlet, orange, yellow, and finally greenish on exposure.

Substance. Gristly and strong ; horny when dry.

Character of Frond. Tufts of very long, narrow, even stems ; furnished with long, narrow, regularly alternate branches ; these re-branched with a second series ; these again with a third ; the series diminishing gradually in length ; all at one level, like the plumes of a feather (*pinnate*) ; each branch lanceolate in general outline. Root fibrous.

Measurement. From 12 to 18 inches long.

Fructification. Only one kind known. A mass of *spores* in oval *capsules*, imbedded in the centre of the last branchlets, their tips protruding beyond.

Habitat. Found on the shore at Freshwater Bay ; also at Ryde, but not a native plant.

A native of the Cape of Good Hope, and probably only accidentally brought to our coasts. For another *Gelidium* see Plate XLIV. Fig. 199.

Fig. 193. GRACILARIA COMPRESSA.

Colour. A transparent dull red ; becoming brighter in fresh water.

Substance. Very tender and brittle ; succulent ; somewhat gelatinous.

Character of Frond. Tufts of cylindrical, or somewhat compressed stems, which are either undivided and alternately branched from the base, or partly forked at first ; alternately branched afterwards. Branches long, and mostly simple ; tapering to a fine point ; occasionally furnished with branchlets.

Measurement. From 6 to 12 inches long.

Fructification. Of two kinds. 1. A mass of *spores* in almost conical *capsules* ; external ; *sessile* on the branches. 2. *Tetraspores* minute ; imbedded in the same.

Habitat. South of England. Cast ashore from deep water. Very rare.

Fig. 194. GIGARTINA MAMILLOSA.

Colour. A dark purple.

Substance. Gristly ; tough ; elastic.

Character of Frond. Tufts of, first cylindrical, then flat stems, becoming channelled or grooved upwards, and widening into wedge-shaped, irregularly forked (*dichotomous*) divisions, or branches. Divisions channelled ; more or less broadly wedge-shaped ; often forked at the tips ; the angles acute ; their surface and margins dotted over with minute, short, thick, stalked frondlets, in which the capsular fruit is formed.

Measurement. From 3 to 6 inches high. Width of the divisions varying greatly in different specimens.

Fructification. Only one kind observed. A mass of *spores* in globose *capsules* ; formed on the frondlets.

Habitat. Our coasts generally. On rocks, &c. near low-water mark. Common.

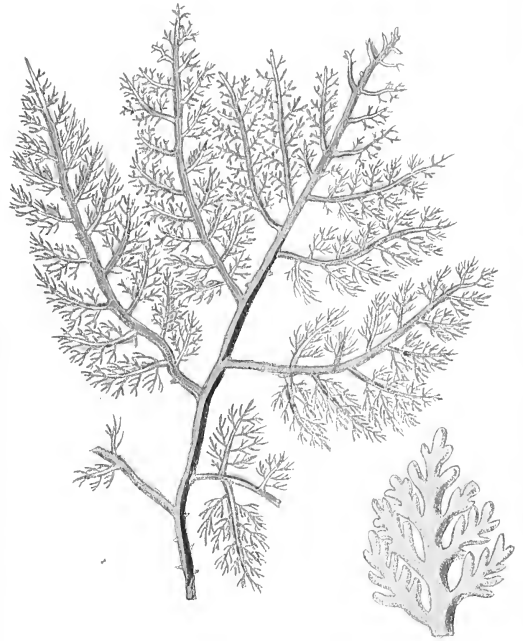
For other *Gigartinas* see Plate XLIII. Fig. 197 ; Plate XLIV. Fig. 201 ; and Plate L. Fig. 225.

191.



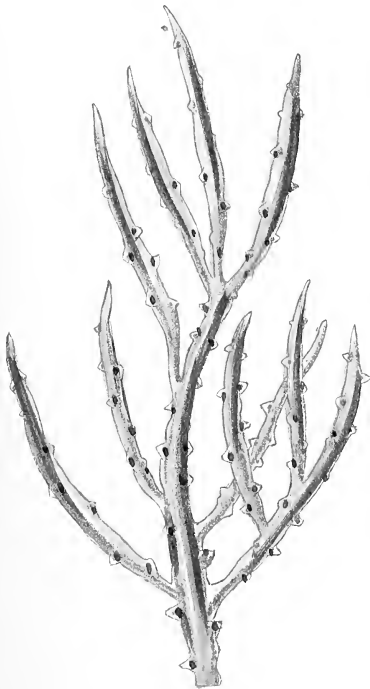
Sphaerococcus coronopifolius, Ag.

192.



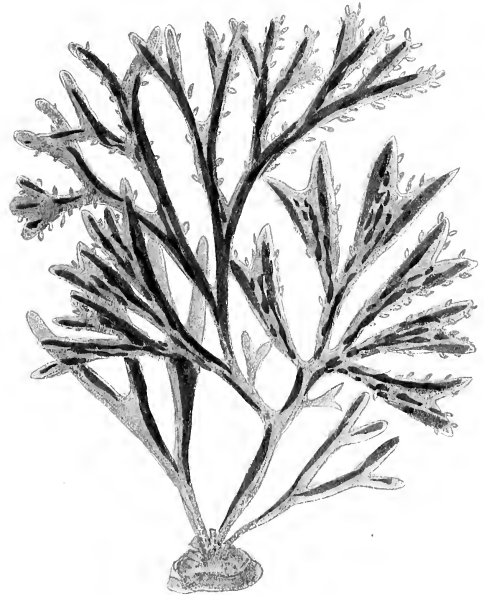
Gelidium cartilagineum, Coll.

193.



Gracilaria compressa, Grev.

194.



Gigartina mamillosa, J. Ag.

PLATE XLIII.

Fig. 195. CYSTOCLONIUM PURPURASCENS.

Colour. A dull, purplish-red ; becoming redder in fresh water ; pinky towards the tips.

Substance. When fresh, thick ; fleshy ; semi-transparent and very brittle. When dry, becoming tough, and shrinking considerably.

Character of Frond. Thread-shaped (*filiform*), long, bushy, excessively branched. Stem generally undivided ; bearing long alternate spreading branches tapering to each end. Branches either simple or forked, bearing a second and third set of similar character. Branchlets many times divided (almost in tufts), scattered both on stem and branches ; with very acute tips. Root fibrous.

Measurement. From 6 inches to 2 feet long.

Fructification. Of two kinds. 1. A mass of *spores* in globose *capsules* ; formed in the branchlets ; swelling them out. 2. *Tetraspores* imbedded in the lesser branches.

Habitat. Our coasts generally. On rocks, stones, and algæ. Between tide-marks. Very common.

Collectors will do well to accustom themselves to the new name of this plant, *Cystoclonium purpurascens*, as Dr. Harvey has no hesitation in declaring that it was erroneously placed among the *Hypneas*. The name *Hypnea* is accordingly dropped altogether.

Fig. 196. GRACILARIA MULTIPARTITA.

Colour. A dull purplish-red ; becoming redder in fresh water ; pinky towards the tips.

Substance. When fresh, thick ; fleshy ; semi-transparent and very brittle. When dry, becoming tough, and shrinking considerably.

Character of Frond. Flat ; narrow ; repeatedly but irregularly forked or divided, from the base ; at one level, as if cut out. Divisions (*laciniæ*) narrow-wedge shape ; their tips acute.

Measurement. From 4 to 12 inches long.

Fructification. Of two kinds. 1. A mass of *spores* in conical, very prominent *capsules* ; external ; *sessile* on the surface of the frond-divisions. 2. *Tetraspores* imbedded in the same.

Habitat. South coast of England. On rocks, &c. in deep water. Very rare.

Fig. 197. GIGARTINA PISTILLATA.

Colour. A dull purple, becoming darker in drying.

Substance. Gristly when fresh; horny when dry.

Character of Frond. Compressed, simple, narrow-wedge-shaped stems, spreading into branches right and left above, in a repeatedly forked manner (*dichotomously*); forming a broadly fan-shaped outline. Angles of branching (*axils*) wide and rounded; tips acute. Branches naked, or clothed with short horizontal, simple or forked branchlets, on which the capsular fruit is borne. Fruiting in winter.

Measurement. From 3 to 6 inches long.

Fructification. Of two kinds. 1. A mass of *spores* in large spherical *capsules*, depressed in the centre; no darker than the frond; external; *sessile* on the branchlets, either singly or in pairs. 2. *Tetraspores* in groups (*sori*) immersed in the branches; distorting them.

Habitat. Coast of Cornwall, Jersey. On rocks near low-water mark. Very rare.

For another *Gigartina*, see next Plate.

Fig. 198. GRACILARIA CONFERVOIDES.

Colour. A pale or deep red; becoming paler in decay.

Substance. Rigid; gristly; not adhering to paper.

Character of Frond. Long; thread-shaped (*filiform*); solid; irregularly (often very slightly) branched. Branches long and simple, or here and there forked; either naked, or furnished with a few short branchlets. Branchlets tapering to each end.

Measurement. From 3 to 20 inches long.

Fructification. Of two kinds. 1. A mass of *spores* in globose *capsules*; external; *sessile* on the branches; abundant. 2. *Tetraspores*; minute; imbedded in the same.

Habitat. Our shores generally. On rocks and stones in the sea near low-water mark. Not uncommon.

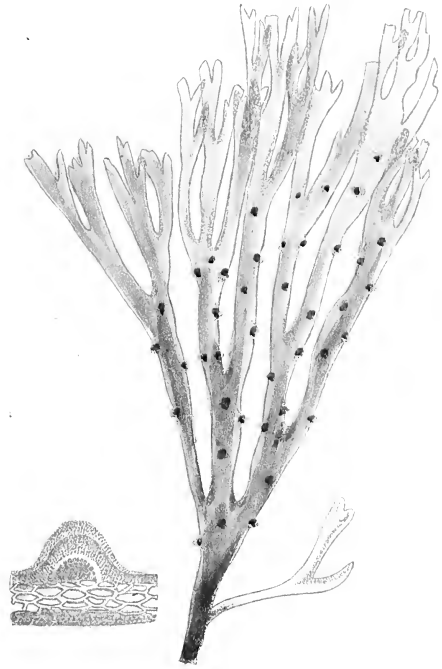
Varying very much in length and the amount of branching. Var. *β. procerrima* has its branches "very long, generally simple, and almost naked." Var. *γ. albida* is compressed instead of thread-shaped, and several times forked, with awl-shaped branchlets. Var. *δ. geniculata* is distorted and bent, as if broken, where the capsules occur.

195.



Cystoclonium purpurascens, Harv.

196.



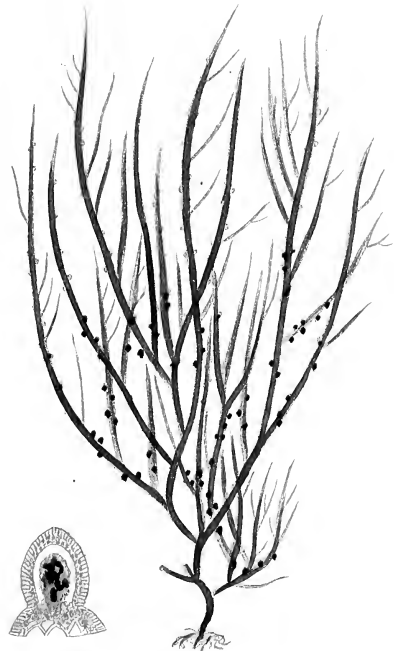
Gracilaria multipartita, J. Ag.

197.



Gigartina pistillata, Lamour.

198.



Gracilaria confervoides, Grv.

PLATE XLIV.

Fig. 199. GELIDIUM CORNEUM.

Colour. Dull purplish-red, becoming pink and yellow on exposure, or in fresh water.

Substance. Between gristly and horny; polished.

Character of Frond. Flat or thread-shaped (*filiform*), very narrow, stiff; formally branched; the whole at one level, as if cut out. Stems one width throughout; alternately branched; set with short, simple, wide-spread branchlets. Branches tapering to both ends; re-branched once or twice, exactly in the same manner as the stems. Branchlets mostly opposite, almost horizontally set, always tapering to the base; blunt at the tips, in which the capsular fruit is formed.

Measurement. From 1 to 8 inches high.

Fructification. Of two kinds. 1. A mass of spores in oval capsules, formed in the tips of the branchlets. 2. *Tetraspores* immersed in the same.

Habitat. Our coasts generally, but shy of the north-east, except the slender, thread-like variety, *G. crinale*. On rocks between tide-marks. Very common.

Fig. 200. GYMNONGRUS GRIFFITHSIÆ.

Colour. A dull purplish-red, fading to yellow on exposure.

Substance. Gristly when fresh; horny when dry.

Character of Frond. Entangled tufts of slender, wiry threads; repeatedly forked (*dichotomous*); the tips of one length; forming a round outline. Branches wavy; of one thickness throughout. Angles of branching (*axils*) wide and rounded. Divisions often much crowded above.

Measurement. From 2 to 4 inches high.

Fructification. Only one kind known. *Tetraspores* forming oblong, wart-like swellings, which by degrees surround the stem. (See figure.)

Habitat. Devonshire. Bantry Bay. Orkney. Isle of Man. On rocks near low-water mark. Not very common.

For another *Gymnogongrus* see Plate XLVI. Fig. 211.

Fig. 201. GIGARTINA TEEDII.

Colour. Purplish; brighter in fresh water; fading to purplish-pink.

Substance. Membranaceous, but firm; limp when fresh; horny when dry.

Character of Frond. Flat; narrow; formally branched; at one level, as if cut out (*distichous*). Stems either simple or once forked; set with long, horizontally spread branches, tapering to each end, finely pointed; once or twice re-branched in the same way. Branchlets slender, tapering; the ends often very much drawn out; last set short, thorn-like; finely pointed; horizontal.

Measurement. From 2 to 5 inches long.

Fructification. A mass of spores in globose capsules; sessile on the last set of branchlets. *Tetraspores* immersed in the same.

Habitat. Elberry Cove, Torbay.

Fig. 202. CHONDRUS CRISPUS.

Colour. Lurid purple in deep water, giving out rainbow-tints; greenish or yellowish in shallow pools near high-water mark; fading to actual white.

Substance. Thickish and firmly elastic; horny when dry.

Character of Frond. Flat; repeatedly forked (*dichotomous*); spreading from a stem which is taper at base; narrow-wedge shape upwards. Outline fan-shaped or round. Divisions wedge-shaped; flat or curled; sometimes very narrow; sometimes very wide; often profuse and spreading; overlapping each other; angles of branching (*axils*), rounded; tips obtuse, and commonly forked. Margins sometimes fringed with frondlets. Root a disc.

Measurement. From 2 to 10 inches high.

Fructification. Of three kinds. 1. Masses of minute *spores* in prominent, oval *capsules*; immersed in the lesser frond-divisions. Rare. 2. *Tetraspores* in large oval groups (*sori*), scattered all over the surface; often prominent to one side only. Common. 3. Prominent *warts*, composed of radiating threads; imperfectly understood.

Habitat. All our rocky coasts. Finest in deep water. Very common.

So variable in appearance that no description will suit all the forms. This is the plant sold as "Carrigeen," or Irish moss. When boiled down to a jelly it is good for coughs and general weakness; excellent also for fattening cattle. It contains a large per-centage of nitrogen.

Fig. 203. CHONDRUS NORVEGICUS.

Colour. A deep, dull blood-red; or morone.

Substance. Firm and elastic; thinner than in *Chondrus crispus*.

Character of Frond. Flat; narrow; repeatedly forked (*dichotomous*); spreading from a short cylindrical stem. Outline fan-shaped or round. Divisions widening a little, but not much, upwards; angles of branching (*axils*) wide-spread; tips rounded.

Measurement. From 2 to 3 inches high.

Fructification. Of two kinds. 1. Minute *spores* in tiny *capsules*, imbedded in the substance of the frond, slightly prominent to both surfaces. 2. *Tetraspores* collected into round groups (*sori*); scattered on both surfaces, prominent.

Habitat. The warmer southern and western stations on our coasts. On rocks near low-water mark. Fine at Miltown Malbay. Salteats; Dr. Lansborough. Rather rare.

Now *Gymnogongrus Norvegicus*. Preferring warm to cold latitudes; so that the name is an unlucky one.

Fig. 204. CATENELLA OPUNTIA.

Colour. Dark, dull purple.

Substance. Membranaceous. Tender and soft; more or less full of moisture.

Character of Frond. Densely tufted; rising from creeping fibres; semi-tubular; constricted at intervals, as if jointed; resembling the Indian fig (*Cactus Opuntia*) in miniature; irregularly branched from the constrictions.

Measurement. From $\frac{1}{2}$ to an inch high.

Fructification. Of two kinds. 1. Masses of *spores* in broadly-oval *capsules*, formed in one of the lesser branchlets. 2. *Tetraspores* immersed in the same.

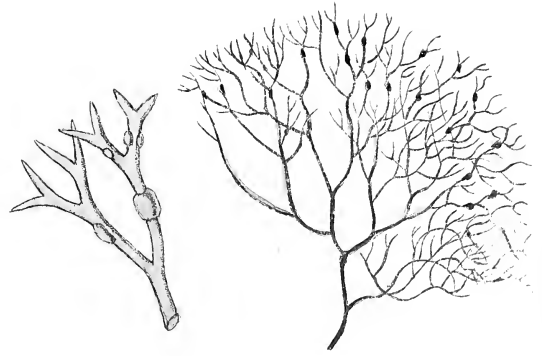
Habitat. Our coasts generally. On rocks near high-water mark. Common.

199.



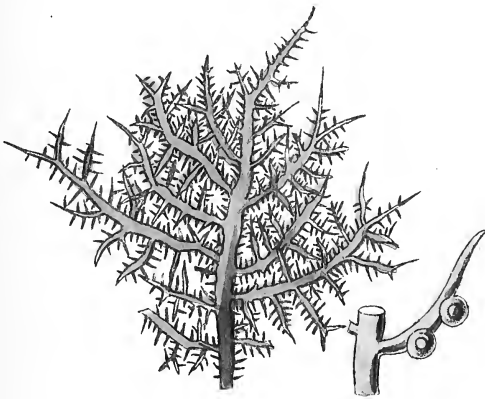
Gelidium corneum, Lamour.

200.



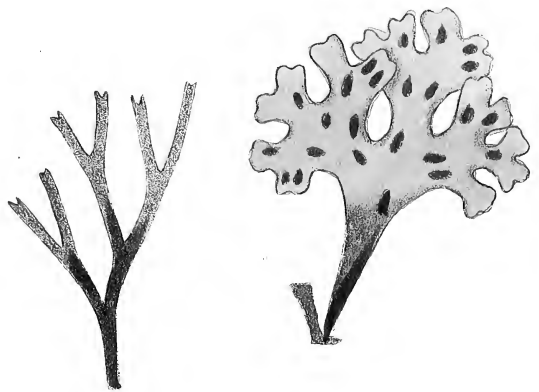
Gymnogongrus Griffithsia, Mart

201.



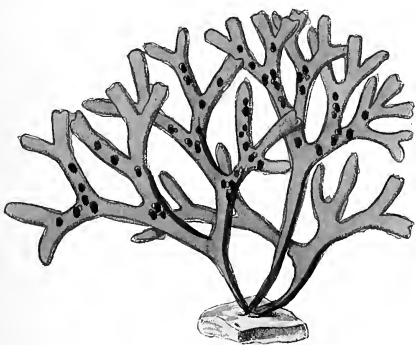
Gigartina Teedii, Lamour.

202



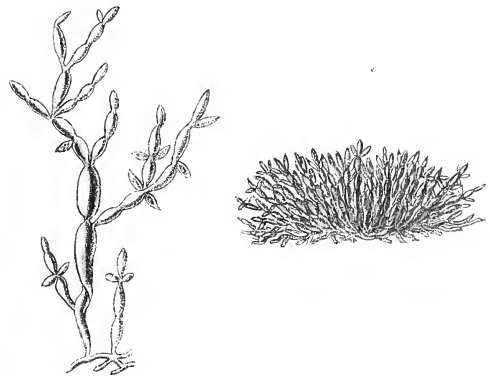
Chondrus crispus, Lyngb.

203.



Chondrus Norvegicus, Lamour.

204



Catenella Opuntia, Grv.

PLATE XLV.

Fig. 205. PHYLLOPHORA RUBENS.

Colour. A fine deep red.

Substance. Stiff; rigid; though membranaceous.

Character of Frond. Flat, leafy, narrow wedge-shaped; forked or simple; obscurely mid-ribbed at base; throwing out secondary shoots of the same formation from the upper surface; this second set throwing out a third in the same way; and so on. The surfaces obstinately crumpled; often covered with parasites. Tufted.

Measurement. From 3 to 8 inches long.

Fructification. Of two kinds. 1. A mass of *spores* in minute, roundish, wrinkled *capsules*; scattered on the surface. 2. *Tetraspores* in *warts*, formed at the base of small, leafy, scattered frondlets.

Habitat. Our rocky shores generally; but preferring the warmer stations. Under shelter of rocks near low-water mark. Frequent.

Very handsome when not infested by *Melobesias* and *Zoophytes*; but always a rather unmanageable plant to lay out, and never adhering to paper.

Fig. 206. PHYLLOPHORA MEMBRANIFOLIA.

Colour. Purple, or purplish-red; fading to green and yellow.

Substance. Stems gristly; frondlets membranaceous, but rigidly so; especially when old.

Character of Frond. Cylindrical, irregularly divided stems, bearing irregular branches, all of which expand into flat, fan-like, or wedge-shaped frondlets, more or less divided and forked. Margins sometimes smooth; sometimes jagged with tiny leaflets; especially above. Tufted.

Measurement. From 3 to 12 inches long.

Fructification. Of two kinds. 1. A mass of *spores* in egg-shaped *capsules* on short stalks, fringing the stems. 2. *Tetraspores* collected into large, dark, heart-shaped groups (*sori*), in the lower half of the frondlets.

Habitat. Our rocky shores generally; but preferring the warmer stations. On rocks between tide-marks. Frequent.

Fig. 207. PHYLLOPHORA BRODIAEI.

Colour. A bright, clear, pinky-red.

Substance. Delicately membranaceous, but rigid. Stems elastic.

Character of Frond. Cylindrical stems becoming flat and narrow wedge-shaped, or oblong, upwards; forked or simple; throwing out frondlets from their upper margin. Frondlets at first cylindrical; soon expanding into oblong or wedge-shape; simple or forked, throwing out secondary frondlets from their tips. This second set throwing out a third in the same way, and so on.

Measurement. From 1 to 8 inches long.

Fructification. Of two kinds. 1. A mass of spores in globose capsules, sessile on the tips of the frondlets. 2. Tetraspores formed in warts, of nearly the same size as the capsules, but stalked.

Habitat. Eastern coast of Scotland. Belfast Bay. On rocks in the sea. Rare.

For another *Phyllophora*, see Plate L. Fig. 228, to which the smaller form in the present figure (207) refers. *Phyllophora palmettoides* is a subdivision of plants which were once classed together under *P. Brodiaei*; and the dark sorus here figured is peculiar to *P. palmettoides*.

Fig. 208. FURCELLARIA FASTIGIATA.

Colour. Brownish-purple; often nearly black when picked up, and becoming so on drying.

Substance. Solid; strong; opaque; elastic, but fleshy.

Character of Frond. Cylindrical, smooth; repeatedly forked, from a short taper stem; thicker above than below; the forkings long and narrow, all the angles of branching (*axils*) being acute. Root a mass of fibres. Fruiting in winter.

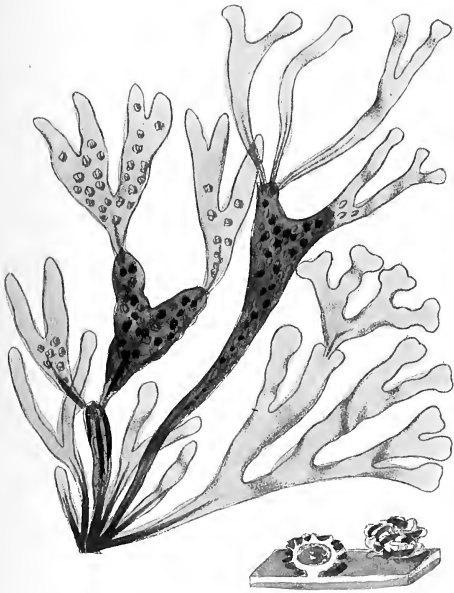
Measurement. From 6 to 12 inches long.

Fructification. Of two kinds. 1. Masses of spores (*favellæ*) imbedded in the swollen upper forkings. 2. Tetraspores deeply imbedded in the same.

Habitat. Our coasts generally. On rocks within tide-marks. Common.

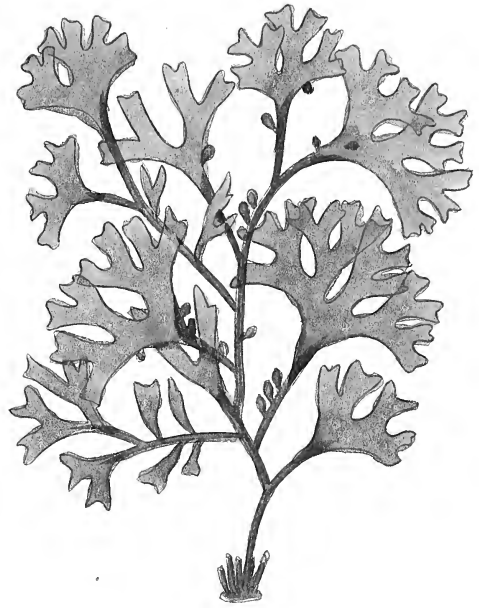
When in fruit the upper divisions are swollen into a lanceolate pod-like form; somewhat flattened in shape.

205



Phyllophora rubens, Grev

206



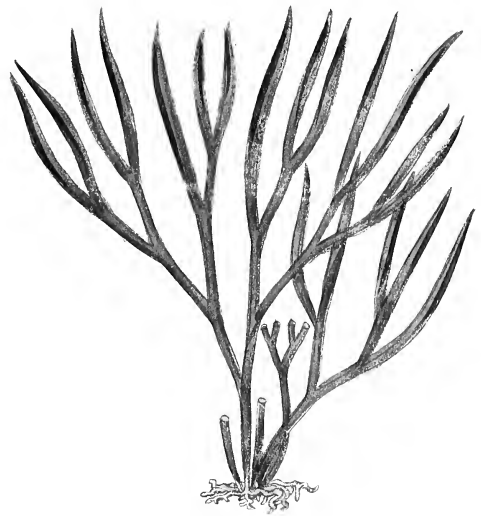
Phyllophora membranifolia, J.Ag.

207



Phyllophora Brodiaei, J Ag

208



Furcellaria fastigata, Lamour

PLATE XLVI.

Fig. 209. DUMONTIA FILIFORMIS.

Colour. Dull purple ; fading to green and yellow.

Substance. Gelatinous ; membranaceous ; tender ; very slippery to the touch.

Character of Frond. A simple stem, finely drawn out and tapering to each end (*attenuated*) ; furnished with long, simple, alternate branches, *attenuated* in the same manner. Both stem and branches cylindrical and tubular ; filled with a watery jelly.

Measurement. Stem sometimes from 8 to 18 inches long, with branches from 4 to 5. In other specimens the stem is very short (from 2 to 3 inches) ; and the branches from 10 to 14. In others there is scarcely any stem at all. In others the whole plant is small and thread-like (*filamentous*).

Fructification. Of two kinds. 1. Roundish masses of *spores* (*favellæ*) immersed in the substance of the frond. 2. *Tetraspores* imbedded beneath the same ; scattered over the branches. Visible like dark dots through.

Habitat. Our coasts generally. On rocks, &c. at half-tide level. Common.

Fig. 210. NEMALEON MULTIFIDUM.

Colour. Dull purple, or purplish-brown.

Substance. Gelatinous ; solid ; very elastic ; firm.

Character of Frond. Cylindrical, about the thickness of a crow's quill ; once or twice forked, distantly ; or simple ; or irregularly, slightly branched. Axils rounded and clumsy.

Measurement. From 3 to 6 inches long.

Fructification. Only one kind known. Globular masses of *spores* attached to the filaments which form the outer layer of the frond. Visible like dark dots through.

Habitat. Our coasts generally in the warmer stations. Common along the western shores of Scotland and Ireland. On rocks and shells near low-water mark in exposed situations. Not unfrequent.

Fig. 211. GYMNOGONGRUS PLICATUS.

Colour. Dark-purple ; fading to pinky and white.

Substance. Remarkably horny and stiff.

Character of Frond. Like fine wire ; of one thickness throughout. Cylindrical ; slender ; entangled ; often in large bundles ; very irregularly branched ; partly forked (*dichotomous*), partly alternate or *secund* (two or three branches on one side in succession) ; more or less furnished with short branchlets, horizontally set, and sometimes spreading in all directions. All the angles of branching (*axils*) rounded.

Measurement. From 4 to 10 inches long.

Fructification. Only one kind found ; and that imperfectly understood. Oblong warts embracing the stem, composed of very slender, jointed radiating threads.

Habitat. Our rocky shores generally. On rocks between tide-marks, and at a greater depth. Common.

Now *Ahnfeldtia plicata*. For another *Gymnogongrus*, see Plate XLIV. Fig. 200.

Fig. 212. POLYIDES ROTUNDUS.

Colour. Brownish-purple ; becoming much darker in drying.

Substance. Between gristly and fleshy ; solid ; elastic.

Character of Frond. Cylindrical ; of one thickness throughout (about that of whip-cord) ; repeatedly forked (*dichotomous*) ; the tips cut to one level, forming a rounded outline ; the last forkings short ; angles of division (*axils*) rounded. Tufted. Root a wide-spread disc.

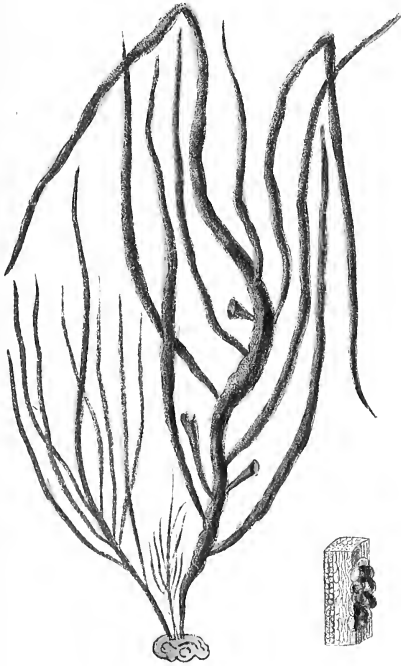
Measurement. From 4 to 6 inches high.

Fructification. Of two kinds. 1. Clustered groups of *spores*, nestling among threads, in large oblong, but irregular, spongy warts, which are pink when fresh ; external ; embracing the stems. 2. *Tetraspores* deeply imbedded in swollen upper branchlets.

Habitat. Our coasts generally. On rocks and stones between tide-marks. Common.

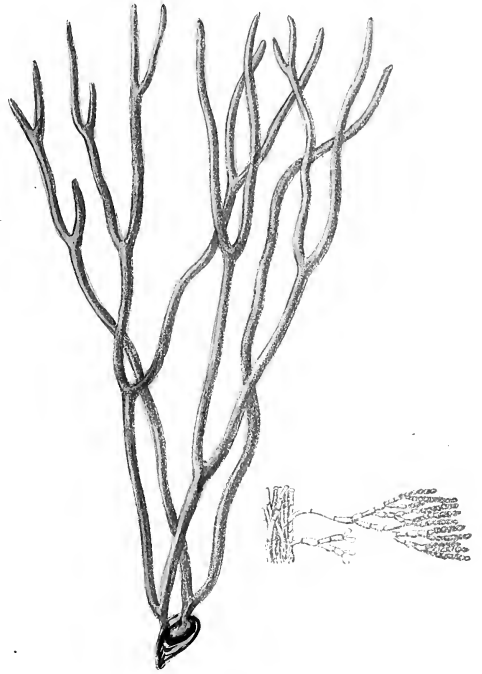
Very like *Furcellaria fastigiata*. Distinguishable, however, by its disc root ; and its spongy parts of fructification when these are present. Otherwise by its *rounded axils* and the shortness of the last forkings.

209.



Damontia filiformis, Grev.

210.



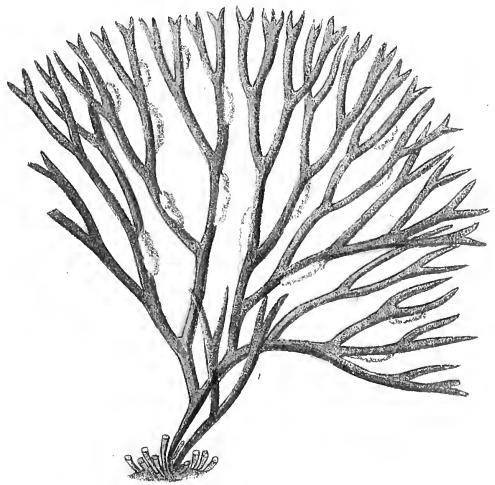
Nemaclon multifidum, J. Ag.

211.



Gyranogongrus plicatus, Kütz.

212.



Polyides rotundus, Grev.



PLATE XLVII.

Fig. 213. KALLYMENIA DUBYI.

Colour. A dull red ; becoming pale and yellow when old.

Substance. Fleshy-membranaceous ; feeling like soft, wet kid-leather.

Character of Frond. A flat, ribless, leafy expansion, rising wedge-wise, from a very short, compressed stem. Outline pear or wedge-shaped. At first quite simple ; afterwards apt to be torn and divided ; probably by the waves. Margins sometimes wavy. Root a disc.

Measurement. From 6 to 12 inches long.

Fructification. Only one kind observed. Round clusters of *spores* half-immersed in, and scattered over, the frond.

Habitat. South of England, and west and south of Ireland ; Scilly. On rocks and stones between tide-marks in land-locked bays. Not common.

Now *Schizymenia Dubyi*.

Fig. 214. IRIDÆA EDULIS.

Colour. A fine deep red ; becoming dark when dry.

Substance. Fleshy ; gristly ; almost leathery ; firmly elastic.

Character of Frond. A flat, ribless, leafy expansion, rising gradually from a short, taper stem. Several from one root. Outline pear-shaped. Always quite simple, but often torn by the waves, as well as eaten into holes by sea-worms. Margins smooth and even. Root a large, expanded disc.

Measurement. From 4 to 18 inches long ; from 2 to 8 wide.

Fructification. Of two kinds. 1. Round clusters of *spores* half immersed in, and scattered over, the frond. 2. *Tetraspores* in oblong groups (*sori*) also immersed and scattered. Both showing like dark spots when the plant is held up to the light.

Habitat. Our coasts generally, near low-water mark, and beyond. Common.

Now *Schizymenia edulis*.

Fig. 215. KALLYMENIA RENIFORMIS.

Colour. A fine, deep crimson.

Substance. Fleshy-membranaceous. Soft and thickish when fresh; becoming thinner in drying. Stems gristly.

Character of Frond. Roundish or kidney-shaped (broader than long) expansions, suddenly spreading from a very short, cylindrical, simple, or branched stem. Expansions very irregular in shape and size; either quite simple or bearing along their margin frondlets of a similar character, and often bigger than the original one. Margins smooth, except when torn; rarely, waved. Root a disc.

Measurement. From 1 to even 14 inches in diameter.

Fructification. Of two kinds. 1. Round clusters of *spores* half immersed in, and scattered over the frond. 2. *Tetraspores* very minute; imbedded in the same. Fruiting in winter.

Habitat. The warmer stations on our coasts. Isle of Wight; Scilly Isles; &c. The Orkney Islands (probably owing to Gulf-stream influence). Kilkee. In deep shady pools at extreme low-water mark. Rare.

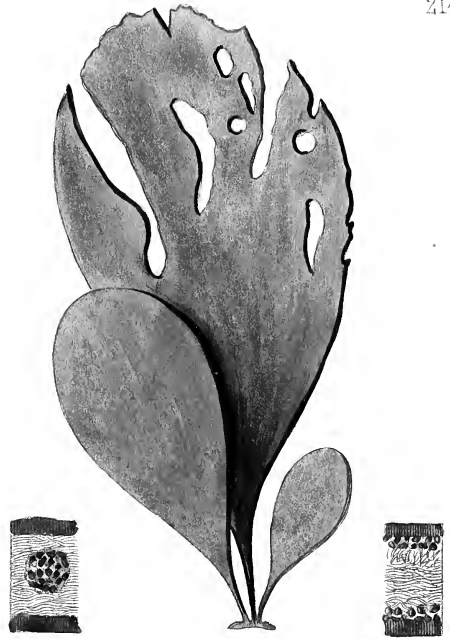
The small form (*K. microphylla* of Agardh), exactly corresponding to the figure in English botany, is frequently cast ashore in winter-time, in Niton Bay, Isle of Wight. In this variety, the sturdy little stems generally give out several fronds; and the spore-groups are very large in proportion to the size of the plant. Two small lobes in the upper part of the present figure represent this. The larger sort needs more Gulf-stream warmth than the Isle of Wight can boast of. Specimens from Kilkee would make a dozen of the Niton winter variety.

213.



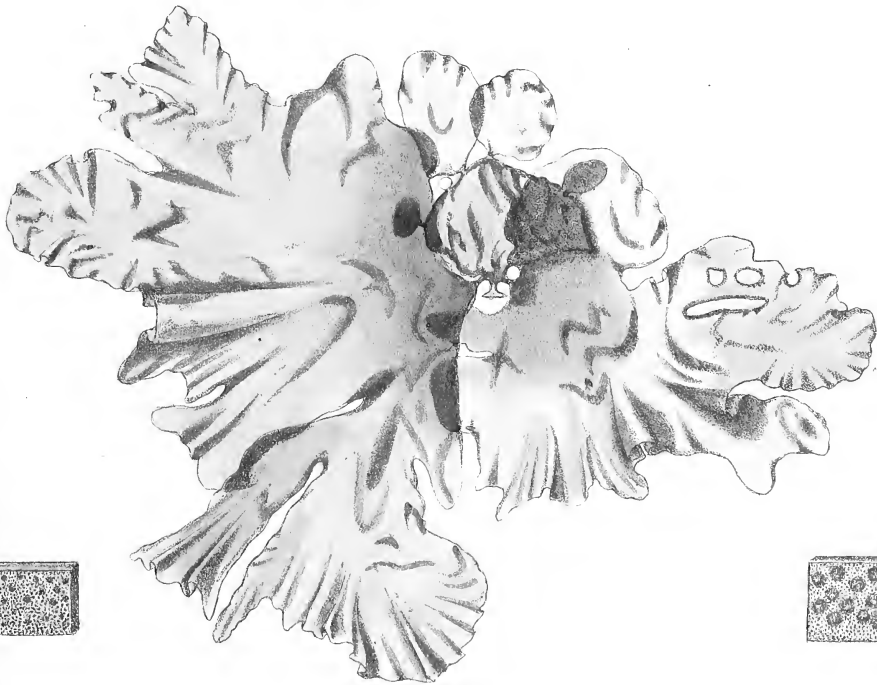
Kallymenia Dubyi, Harv.

214.



Iridæa edulis, Bory.

215.



Kallymenia reniformis, J.Ag.

PLATE XLVIII.

Fig. 216. HALYMENIA LIGULATA.

Colour. In the three chief varieties, as follows; *dichotoma*, a clear pinky red; *ramentacea*, paler; *latifolia*, dark red.

Substance. Membranaceous and gelatinous. *Ramentacea*, very thin.

Character of Frond. So variable that the varieties are classed into three sorts, as follow:
1. *Dichotoma*; compressed, narrow; often, though irregularly forked; the divisions of nearly equal width; tapering to both extremities. 2. *Ramentacea*; compressed or nearly cylindrical; full of gelatine; divided into three or four principal portions (*lobes*); tapering to both ends. 3. *Latifolia*; flat; wedge-shaped; either simple or forked; or cleft into finger-like portions (*lobes*). All three sorts have their margins more or less fringed with frondlets; *latifolia* least. Root a disc.

Measurement. *Dichotoma* from 6 to 8 inches long; *ramentacea* from 12 to 14 long and from $\frac{1}{2}$ to an inch in width; *latifolia* from 12 to 20 inches long, and from 2 to 4 wide in the widest part.

Fructification. Only one kind known. Minute masses of *spores*, immersed in, and scattered profusely about the surface, as if it had been dusted with grains of Cayenne pepper.

Habitat. Southern shores of England. On rocks near low-water mark. Rare.

Variable as this plant is in growth, its "pinky colour peculiarly soft substance, between gelatinous and membranaceous, and the innumerable dots of fructification, are found in every specimen and sufficiently mark the species." HARVEY.

Fig. 217. NEMALEON PURPUREUM.

Colour. A fine purple red which is given out in fresh water.

Substance. Tender and gelatinous; slippery to the touch.

Character of Frond. Long, cylindrical stems and branches. Stem as thick as a goose-quill; properly tapering to both ends, but the tip sometimes broken, and throwing out several lesser shoots; set with long, wide-spread, wavy, worm-like branches. Branches simple or furnished with a second set, of much reduced size; all tapering when not broken. A few slender branchlets scattered irregularly over stem and branches. Root a disc.

Measurement. From $\frac{1}{2}$ a foot to $2\frac{1}{2}$ feet long.

Fructification. Only one kind known. Roundish masses of *spores* sunk among the filaments which form the outer layer of the frond.

Habitat. South of England and west of Ireland. In sandy places among *Zostra*, near low-water mark. Rare.

Now *Helminthocladia purpurea*.

Fig. 218. NACCARIA WIGGII.

Colour. A delicate, bright rose-red.

Substance. Tender and gelatinous; adhering closely to paper.

Character of Frond. Slender; thread-shaped (*filiform*); much branched. Stem undivided or once forked; set with very long, wavy, horizontally-spread, alternate branches, all tapering to the end. These re-branched with a second, finer set of similar character. Both stem and branches clothed with very short slender branchlets, tapering at both ends, which spring all round the stem. Root a disc.

Measurement. From 6 to 12 inches long.

Fructification. Only one kind known. *Spores* immersed in centre of the fringing branchlets, which are then swollen (see figure of a magnified bit).

Habitat. Yarmouth and the southern shores of England. South and west of Ireland. Isle of Man. West of Scotland. Thrown up from deep water. Very rare.

Fig. 219. GLOIOSIPHONIA CAPILLARIS.

Colour. Rose-red; though scarcely when first gathered.

Substance. Exceedingly gelatinous; loose and slippery-feeling.

Character of Frond. Long, cylindrical, tubular stems, profusely branched; bushy; tufted; each forming a more or less lanceolate, general outline. Stems undivided, delicately tapering to both ends; set with opposite, often *quadrifarious* (springing from four points of the stem) branches; which are bushily re-branched with repeatedly divided branchlets. Branchlets very slender or thickened with fructification; springing from all round the stems. Root a disc; throwing up several fronds.

Measurement. From 3 to 12 inches long.

Fructification. Only one kind known. Round masses of bright-red *spores* immersed in the (then) swollen branchlets.

Habitat. Our shores generally. Filey, Largs, &c. In tide-pools, near low-water mark. Very rare generally. Common in Jersey.

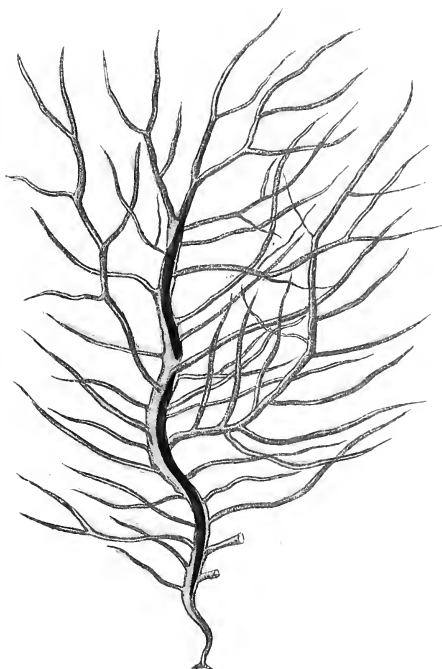
Whimsical in its appearance and disappearance in different seasons, but there is a large, transparent, not very deep pool, on the lowermost ledges of Filey Bridge, north, where it may generally be gathered by those who will wade in to reach it!

216.



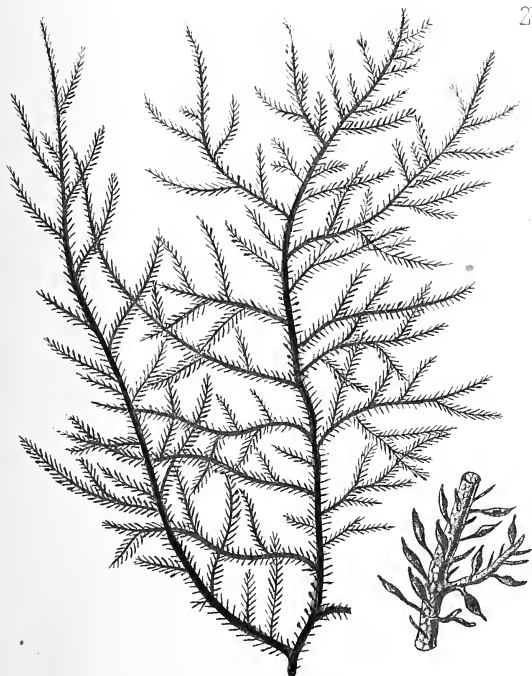
Halymenia ligulata, Ag.

217.



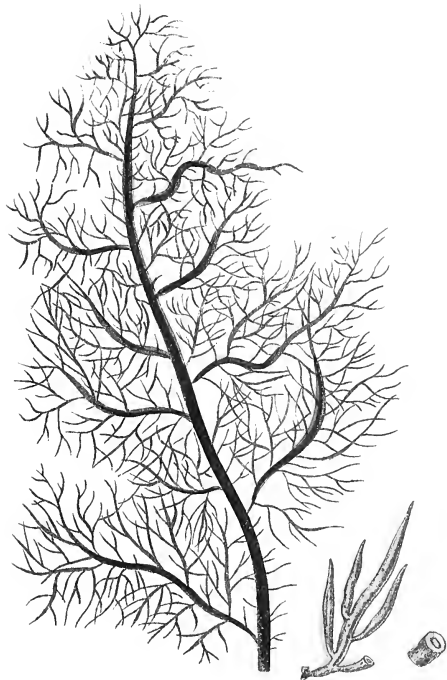
Nemalion purpureum, Chauv.

218.



Naccaria Wiggi, Endl.

219.



Gloiosiphonia capillaris, Carn.

PLATE XLIX.

Fig. 220. DUDRESNAIA COCCINEA.

Colour. Rosy-red ; pinkish when young.

Substance. Very tender and gelatinous ; loose and slippery-feeling.

Character of Frond. Cylindrical stem and branches ; rather distantly, and very irregularly divided (alternate, opposite, forked, or secund) ; each set gradually finer upwards. Branchlets much divided ; young specimens, when seen through a lens, looking as if beaded with rose-coloured dots owing to the structure (*densely-tufted, dichotomous filaments, whorling a colourless axis!*)

Measurement. From 4 to 8 inches long.

Fructification. Of two kinds. 1. Dark red globules of *spores* attached to the filaments which form the outer layer of the frond. 2. *Tetraspores* in transparent cells similarly placed. Very rare.

Habitat. Southern shores of England and Ireland. On rocks near low-water mark ; or from deep water. Very rare.

Fig. 221. DUDRESNAIA DIVARICATA.

Colour. Pale red.

Substance. Gelatinous ; very soft ; elastic.

Character of Frond. A cylindrical, thread-like (*filamentous*), much-branched stem ; undivided ; set with long opposite or alternate, horizontally-spread branches. Branches three or four times re-branched ; all the branches alternate ; horizontally spread. Branchlets numerous ; horizontal ; obtuse.

Measurement. From 3 to 6 inches long.

Fructification. Only one kind known. Globules of *spores* attached to the filaments which form the outer layer of the frond.

Habitat. The warmer stations on our coasts. On stones and the smaller algæ near low-water mark ; and deeper. Very rare.

Now *Helminthora divaricata*.

Fig. 222. Ptilota sericea.

Colour. Usually a dull, brownish-red ; sometimes brighter. Brown when old.

Substance. Very soft and limp ; sometimes dense and almost spongy.

Character of Frond. Thread-like (*filamentous*) but compressed ; excessively branched in a formal manner. Main stems irregularly divided ; rough below with minute branchlet stumps. Branches re-branched ; with short, curved, exactly opposite, horizontally-spread branchlets. These re-branched once or twice in the same way. Stem and branches opaque. Branches jointed. (See figure of a magnified bit.)

Measurement. From 2 to 6 inches long.

Fructification. Of two kinds. 1. Clustered globules of *spores*, surrounded with six or eight minute, slender branchleteens (*ramelli*), which fold over them (*involucrated*) ; stalked ; formed at the end of the shortened branchlets. 2. Globules of *tetraspores* formed in the tips of the same.

Habitat. Our coasts generally. On perpendicular rocks between tide-marks. Rarely on the stems of *Fucus serratus*. Common.

Now *Ptilota elegans*. This is the only *Ptilota* found on the south coast of England.

Fig. 223. Ptilota plumosa.

Colour. A fine dark red ; sometimes very clear and bright.

Substance. Gristly and firm.

Character of Frond. Thread-like (*filamentous*), but flat ; excessively branched in a formal manner. Main stems irregularly divided ; smooth ; set with branches of irregular lengths. Branches re-branched ; secondary set (and sometimes the primary) clothed throughout with shortish, curved, wide-spread branchlets. These re-branched once or twice in the same way. Stem branches and branchlets unjointed ; opaque.

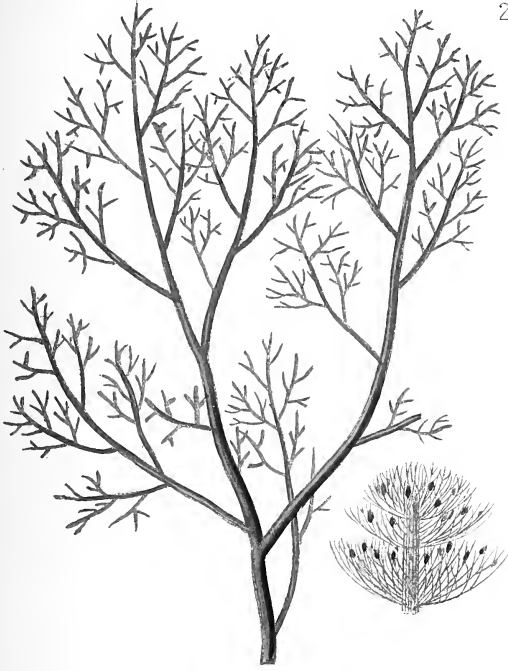
Measurement. From 3 to 14 inches long.

Fructification. Of two kinds. 1. Clustered globules of *spores*, surrounded with six or eight minute, slender branchleteens (*ramelli*), which fold over them ; stalked ; formed on the end of the then shortened branchlets. 2. Globules of *tetraspores* formed in the tips of the same.

Habitat. Northern and western coasts of Great Britain and Ireland. On the stems of *Lam. digitata*. Frequent.

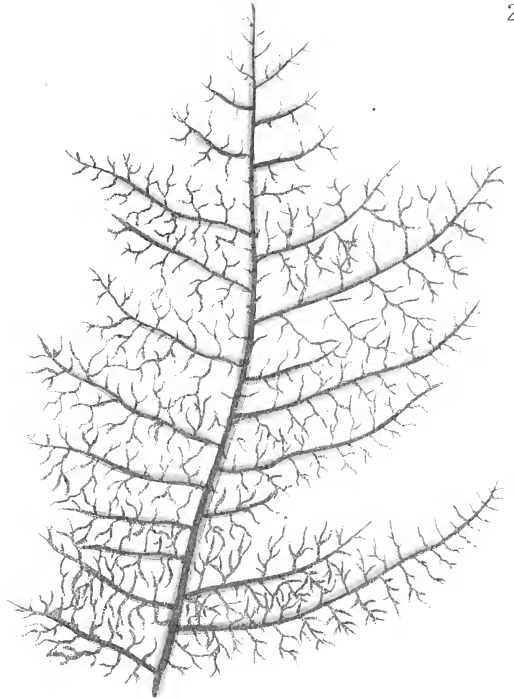
The first set of *branchlets* are often not re-branched quite close to their base, so that the bare spaces look like a narrow white line between them and the stem. This is not the case in *P. sericea*, so that it serves as a clue between the species.

220.



Dudresnaia coccinea, Bonnier

221.



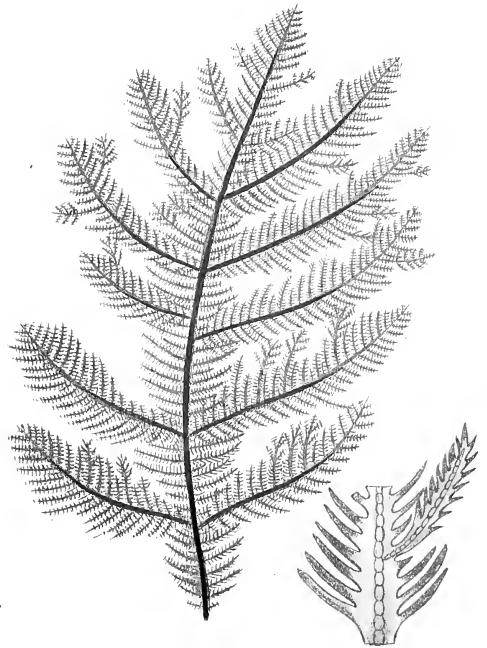
Dudresnaia divaricata, J. Ag.

222.



Ptilota sericea, Gmel.

223.



Ptilota plumosa, Ag.



PLATE L.

Fig. 224. PEYSSONELIA DUBYI.

Colour. Brownish-red.

Substance. Membranaceous.

Character of Frond. A thin, incrusting expansion, at first simple and circular; afterwards cut into divisions (*lobes*); attached to whatever it grows upon by the whole of its under surface, which throws out woolly rootlets. Upper surface marked by rings of lines (*concentric zones*).

Measurement. From 1 to 2 inches across.

Fructification. Only one kind known. *Tetraspores* hidden among radiating threads in wart-like prominences.

Habitat. North of Ireland and west of Scotland. Probably in many places. On old shells, stones, &c., on scallop-banks in from ten to fifteen feet water. Not uncommon.

Fig. 225. GIGARTINA ACICULARIS.

Colour. A dull, purple-red; darker when dry.

Substance. Gristly.

Character of Frond. Cylindrical; wiry; irregularly branched; tufted; of much the same thickness throughout, all but the tips, which are remarkably pointed. Stems curved or wavy; simple or forked. Branches curved and re-curved; wavy; wide-spreading in all directions; once or twice re-branched. Branchlets short, distant; either alternate, opposite, or forked; oftenest *secund*. Root fibrous.

Measurement. From 2 to 4 inches long.

Fructification. Only one kind observed. Clusters of *spores* in globose *capsules*; *sessile* on the branchlets; often several together.

Habitat. South coast of England. Jersey. Belfast. On rocks near low-water mark. Rare.

For other *Gigartinas* refer back to Plate XLIV. Fig. 201; Plate XLIII. Fig. 197; and Plate XLII. Fig. 194.

Fig. 226. GINANNIA FURCELLATA.

Colour. Sometimes a pale pinky, sometimes a dull red, becoming deeper in drying.

Substance. Membranaceous; fleshy; tender.

Character of Frond. Cylindrical; the thickness of a goose-quill throughout; repeatedly and regularly forked (*dichotomous*) from a very short taper stem; forming a circle when spread. Occasional specimens, midribbed; or sometimes constricted here and there as if jointed. Tips obtuse; broken ones sometimes throwing out fresh frondlets. (See figure.) Root a disc.

Measurement. From 2 to 6 inches long. Diameter of branches varying greatly up to half an inch.

Fructification. Only one kind known. Globular masses of *spores*, immersed in the frond. Showing through, when held up to the light

Habitat. Eastern and southern shores of England. Ireland, all round; and very fine; Scilly. On rocks, &c. from low-water mark to eight or ten fathoms' depth. Rare.

Now *Sciniaia furcellata*.

Fig. 227. CRUORIA PELLITA.

Colour. Blood-red.

Substance. Gelatinous ; leathery.

Character of Frond. Skin-like ; closely adhering ; forming smooth, glossy patches on the surface of smooth rocks. Outline at first circular ; afterwards irregular.

Measurement. Indefinite, up to 2 inches in diameter.

Fructification. Only one kind known. *Tetraspores* immersed ; lying at the base of the filaments of which the frond is composed.

Habitat. Our shores generally. On smooth exposed rocks and stones, between tide-marks. Common.

Fig. 228. PHYLLOPHORA PALMETTOIDES.

Colour. Rosy-pink.

Substance. Membranaceous ; the stems elastic.

Character of Frond. Flat ; ribless ; narrow-oblong or wedge-shaped ; leafy ; expanding from a cylindrical, simple or branched stem. Leaves simple or once-forked ; the first always wedge-shaped ; bearing leaflets from their surface or tips.

Measurement. From $\frac{1}{2}$ an inch to 2 inches long.

Fructification. Only one kind observed. *Tetraspores* forming large oval groups (*sori*) ; lying across the frond near the tips ; immersed in the substance.

Habitat. South coast of England. On rocks near low-water mark. Rare.

For other *Phyllophoras* see Plate XLV.

Fig. 229. CROUANIA ATTENUATA.

Colour. Brownish or purplish-red, fading to a dusty pink.

Substance. Gelatinous.

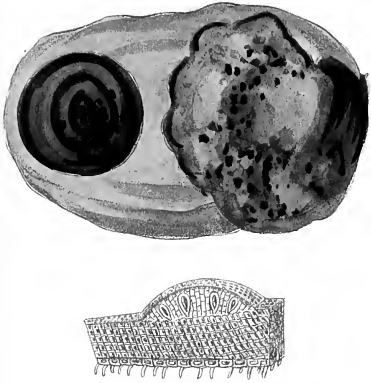
Character of Frond. Slender ; thread-like (*filamentous*) ; jointed ; much branched. Main divisions partly forked (*dichotomous*) ; branches alternate ; more or less re-branched ; the joints clothed all round (*whorled*) with very short, delicate, many-times-divided branchleteens (*ramelli*).

Measurement. One or 2 inches long.

Fructification. Only one kind observed in England. Large oval *tetraspores* in transparent cells ; seated on the *whorled* branchlets, either in pairs, or all round.

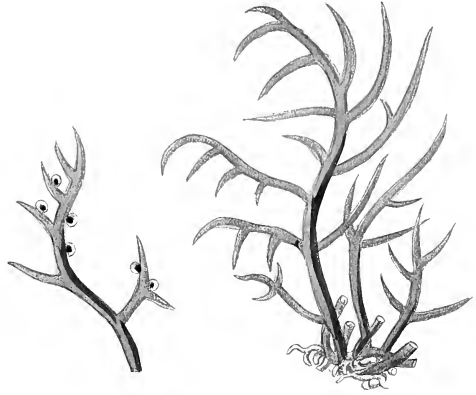
Habitat. South coast of England. Parasitical on the smaller algæ. Very rare.

224



Peyssonelia Dubyi, Gruan.

225.



Gigartina acicularis, Lamour.

226.



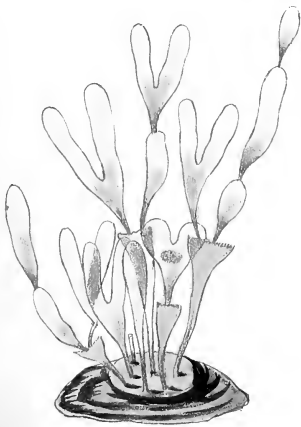
Ginnania furcellata, Mont

227.



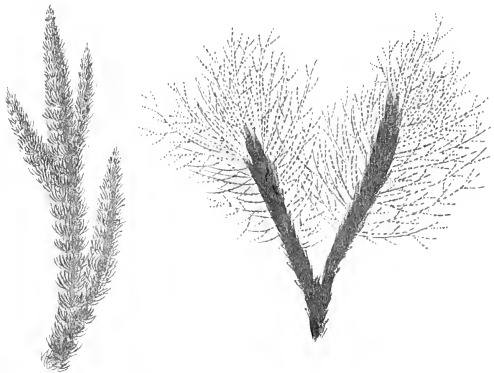
Cruoria pellita, Fries.

228.



Phylliphora Palmnetoides, JAg

229.



Cruonia attenuata, JAg

PLATE LI.

Fig. 230. MICROCLADIA GLANDULOSA.

Colour. A fine rose-red.

Substance. Membranaceous, though firm.

Character of Frond. Thread-like (*filamentous*), though compressed; of nearly the same width throughout; tufted; much branched from the base, in an alternate or irregularly forked manner; forming a roundish outline. Angles of branching (*axils*) wide-spread; last branchlets short; tips either awl-shaped or split, in which case they resemble pincers.

Measurement. One or 2 inches long.

Fructification. Of two kinds. 1. Masses of spores in roundish capsules; surrounded by two or three short branchleteens (*ramelli*); sessile on the margin of the branches. 2. *Tetraspores* imbedded in the tips of the same.

Habitat. South and east coasts of England and Ireland. Hompton (N. of Hull). Bray. Kingstown. Scilly.

Fig. 231. CERAMIUM DECURRENS.

Colour. A dull purplish-pink.

Substance. Soft.

Character of Frond. Tufts of jointed threads (*filaments*); much branched. *Filaments* thicker than hog's bristles below, gradually finer upwards; distinctly forked; naked, or furnished with a few scattered branchlets; the tips hooked inwards.

Joints. Partially coloured; a narrow transparent space in the centre of each (see figure), the coloured portion melting gradually into the white.

Measurement. From 6 to 8 inches long.

Fructification. Not observed.

Habitat. Our coasts generally. On rocks and the smaller algæ in tide-pools. Rare.

Fig. 232. CERAMIUM GRACILLIMUM.

Colour. A dark reddish-purple.

Substance. Very soft, tender, gelatinous.

Character of Frond. Tufts of jointed threads (*filaments*); much branched. *Filaments* excessively slender, more so than a human hair; of nearly the same thickness throughout; regularly forked, or nearly so; the branches set with minute many-times-divided branchlets, spreading fan-wise; the tips slightly hooked.

Joints. Colourless. Partition-lines (*dissepiments*), opaque, purple.

Measurement. From 2 to 3 inches long.

Fructification. Only one kind observed. Minute spores in large, roundish capsules, sessile on the branchlets, often two together. With several slender branchleteens, ray-like, spreading below them; their tips forked.

Habitat. South of England and west of Ireland. On *Corallina officinalis*, &c. between tide-marks. Not common.

Fig. 233. CERAMIUM STRICTUM.

Colour. Dark, livid purple, in deep water, paler and yellower in sunny situations.

Substance. Membranaceous, but not very firmly adhering to paper.

Character of Frond. Tufts of jointed threads (*filaments*); branched. *Filaments* as fine as human hair; of nearly the same thickness throughout; irregularly forked; distantly branched below; more frequently and closely divided above; all the divisions upright and straight, with narrow sharp angles. The tips straight or slightly hooked inwards.

Joints. Colourless. Partition-lines (*dissepiments*), opaque, purple.

Measurement. From 2 to 4 inches long.

Fructification. Of two kinds. 1. Minute *spores* in roundish *capsules*, *sessile* near the tips of the branches; surrounded by several short slender branchlets (*ramelli*) (*involutrated*). 2. *Tetraspores* immersed in the partition-lines of the joints. Very prominent.

Habitat. South coast of England. South and west of Ireland. On *corallines*, &c. in tide-pools near low-water mark. Not common.

Fig. 234. CERAMIUM NODOSUM.

Colour. A delicate red.

Substance. Rigid; rather harsh to the touch when fresh. Imperfectly adhering to paper.

Character of Frond. Tufts of jointed threads (*filaments*), excessively divided. *Filaments* as fine as human hair, or finer, of the same thickness throughout; repeatedly and regularly forked, the angles of branching (*axils*) very wide. The tips slightly hooked.

Joints. Colourless. Partition-lines (*dissepiments*), dark and swollen.

Measurement. From 3 to 6 inches long.

Fructification. Of two kinds. 1. Minute *spores* in globose *capsules*, *sessile* on the tips of short special branchlets; with one or two minute, slender branchlets below. 2. *Tetraspores* two or three together, borne on the outer edge of short special branchlets.

Habitat. On sandy shores, often at the roots of *Zostera*. Generally distributed.

Fig. 235. CERAMIUM FASTIGIATUM.

Colour. Pinky purple.

Substance. Soft, and tender.

Character of Frond. Tufts of jointed threads (*filaments*) much branched. *Filaments* very slender; hair-like; of nearly the same thickness throughout; regularly, and repeatedly forked from the base. The lower angles of branching (*axils*) distant, the upper very close; all narrow. The tips cut to one level, forming a round outline; hooked inwards.

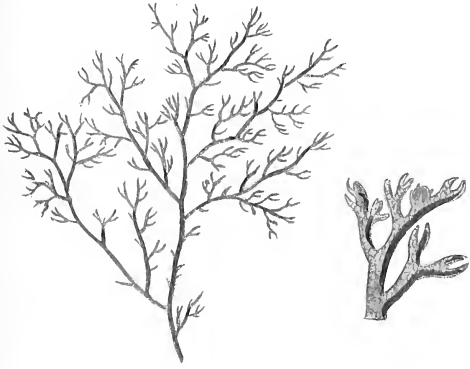
Joints. Lower ones colourless; upper coloured. Partition-lines (*dissepiments*) opaque; swollen, purple.

Measurement. Four or 5 inches long.

Fructification. Only one kind observed. Minute *spores* in small round *capsules* near the tips of the branchlets, with three or four very slender branchlets below.

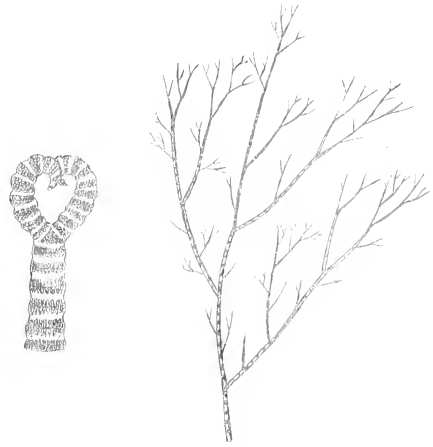
Habitat. Our coasts generally. On rocks in tide-pools. Rare.

230



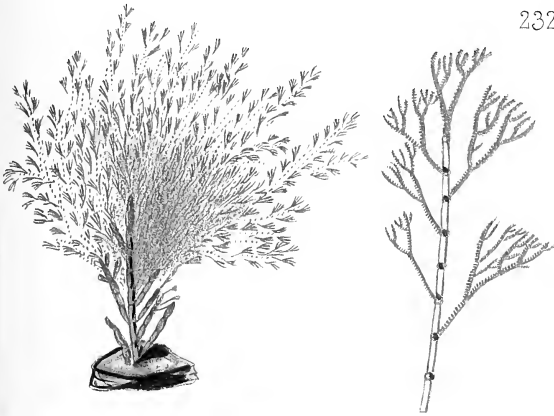
Microcladia glandulosa, Grv.

231



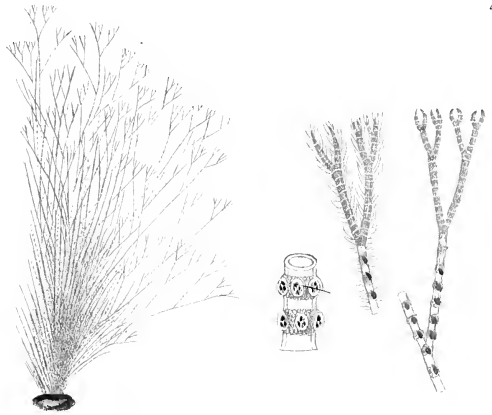
Ceramium decurrens, Kütz.

232



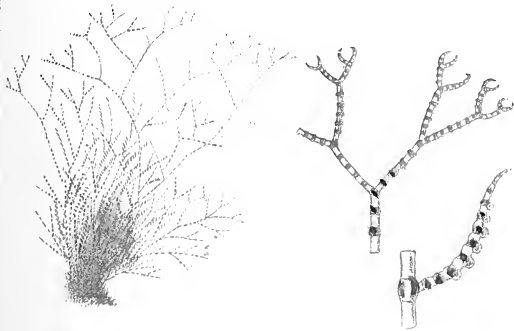
Ceramium gracillimum, Griff.

233



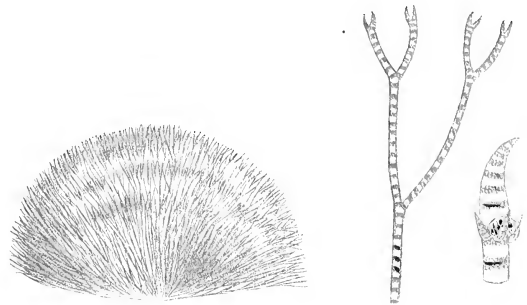
Ceramium strictum, Kütz.

234



Ceramium nodosum, Griff.

235



Ceramium fastigiatum, Haov.

PLATE LII.

Fig. 236. CERAMIUM DESLONGCHAMPSII.

Colour. Dark purple; almost blackish to the naked eye; on examination variegated with white.

Substance. Rigid (for so delicate a plant).

Character of Frond. Tufts of distinctly jointed threads (*filaments*). Filaments nearly as thick as hog's bristles below; becoming gradually finer upwards; much branched in an irregularly forked manner; more or less furnished with very slender, simple or forked branchlets. Tips fine; straightish; spreading.

Joints. In variegated bands. Colourless and transparent in the middle; purplish and opaque at and near the partition-lines (*dissepiments*).

Measurement. From 3 to 4 inches long.

Fructification. Of two kinds, but only one clearly made out. *Tetraspores* set round the joints; half-immersed; very prominent. The other, dark, irregular-shaped lumps like clusters of small *capsules*, *sessile* on the stems and branches.

Habitat. Our coasts generally. On rocks, &c. between tide-marks. Not uncommon.

Fig. 237. CERAMIUM DIAPHANUM.

Colour. Pinkish-red in general hue; but clearly variegated with white.

Substance. Rather soft.

Character of Frond. Tufts of distinctly jointed threads (*filaments*). *Filaments* the thickness of a hog's bristle below, becoming gradually finer upwards; irregularly branched; partly forked, partly alternate; re-branched in the same way, set at greater or less intervals throughout with short or long, more or less forked branchlets, much more slender than the branches from which they spring. Tips hooked inwards.

Joints. In variegated bands. Colourless and transparent in the middle, red, opaque, and swollen at, and near, the partition-lines (*dissepiments*), coloured bands wide throughout.

Measurement. From 2 to 6 inches long.

Fructification. Of two kinds. 1. Minute *spores* in roundish *capsules*, with one or two short branchleteens underneath; *sessile* in the last forkings, or on the tips of side branchlets. 2. *Tetraspores* set round the joints.

Habitat. Our coasts generally. On the smaller algæ in tide-pools. Common.

Fig. 238. CERAMIUM FLABELLIGERUM.

Colour. Dull purple to the naked eye, on examination, of different shades.

Substance. Rigid.

Character of Frond. Tufts of jointed threads (*filaments*) spreading fan-wise above. *Filaments* as thick as hog's bristles; irregularly branched; partly forked; partly alternate; much re-branched above; set with forked branchlets. Tips pointed; straight and spreading; or somewhat curved inwards.

Joints. In variegated bands, but when young filled with a purplish fluid which hinders their detection. Afterwards colourless and transparent in the middle; purple and opaque near the partition-lines (*dissepiments*). These armed on one side with a solitary, minute, coloured (when dry, white) thorn.

Measurement. From 2 to 3 inches high.

Fructification. Of two kinds. 1. Minute *spores* in large irregular-shaped *capsules*, *sessile* on the branchlets, with two or three short branchleteens underneath. 2. *Tetraspores* set round the joints.

Habitat. Our coasts generally. On the smaller algæ, &c. between tide-marks.

Fig. 239. CERAMIUM ECHIONOTUM.

Colour. Dark red or purple when young and fresh, variegated with white when old or dry.

Substance. Rigid and harsh for so delicate a plant.

Character of Frond. Dense tufts of distinctly jointed threads (*filaments*). *Filaments* slender, of nearly the same thickness throughout; repeatedly and regularly forked, forming roundish outlines; frequently set with forked branchlets. Tips more or less hooked in.

Joints. In variegated bands. Colourless and transparent in the middle, reddish or purplish at, and near, the partition-lines (*dissepiments*). These armed all round with a number of slender, hair-like bristles, sticking out in all directions.

Measurement. From 1 to 3 inches long.

Fructification. Of two kinds. 1. Minute *spores* in double *capsules*, *sessile* on the sides of the branchlets, surrounded by several curved branchlets. 2. *Tetraspores* set round the joints.

Habitat. South coasts. On rocks, &c. between tide-marks. Not common.

Fig. 240. CERAMIUM ACANTHONOTUM.

Colour. Dark purple or red, variegated with white.

Substance. Rigid and harsh for so delicate a plant.

Character of Frond. Dense tufts of jointed threads (*filaments*). *Filaments* slender; of nearly the same thickness throughout; repeatedly and regularly forked, forming roundish outlines. Tips (and often the two or three last forkings) strongly hooked in.

Joints. In variegated bands. Colourless and transparent in the middle, purple and opaque at, and near, the partition-lines (*dissepiments*); the coloured bands widest upwards. Each of these armed on the outer side with a solitary, strong, coloured thorn (when dry, white), curved upwards.

Measurement. From 2 to 6 inches long.

Fructification. Of two kinds. 1. Minute *spores* in roundish *capsules* with a solitary curved branchlet underneath. 2. *Tetraspores* set round the joints.

Habitat. Our coasts generally. On rocks, &c. between tide-marks. Common.

Fig. 241. CERAMIUM CILIATUM.

Colour. Pale purple or red; clearly variegated with white.

Substance. Rigid and harsh for so delicate a plant.

Character of Frond. Dense tufts of jointed threads (*filaments*). *Filaments* slender; of nearly the same thickness throughout; repeatedly and regularly forked; with or without side branchlets. Tips (sometimes the two or three last forkings) strongly hooked in.

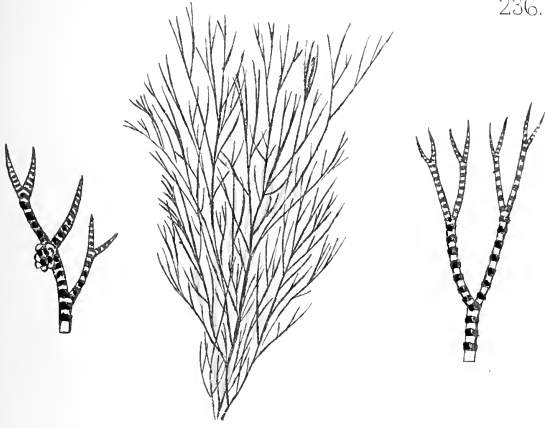
Joints. In variegated bands. Colourless and transparent in the middle, purplish-red at, and near, the partition-lines (*dissepiments*). These armed all round with a line of strong colourless thorns.

Measurement. From 2 to 6 inches long.

Fructification. Of two kinds. 1. Minute *spores* in roundish *capsules* with two or three branchlets underneath. 2. *Tetraspores* set in the coloured bands of the joints with a thorn between each.

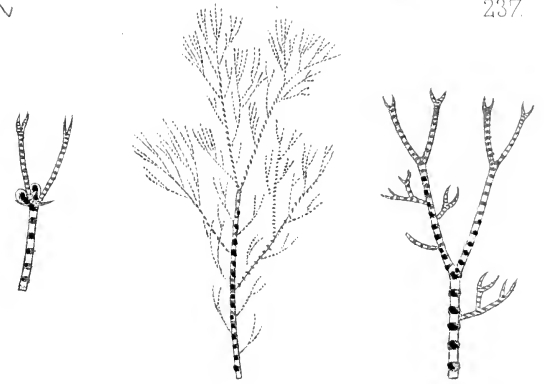
Habitat. Our coasts generally. On rocks, &c. at low-water mark. Not uncommon.

236.



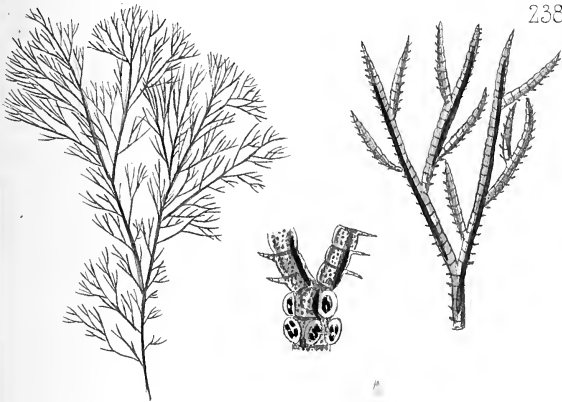
Ceramium Deslongchampsii, Charv.

237.



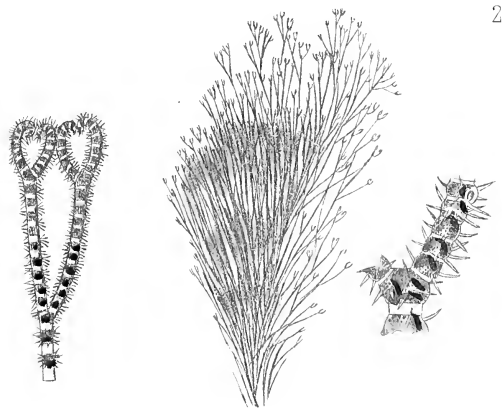
Ceramium diaphanum, Roth.

238.



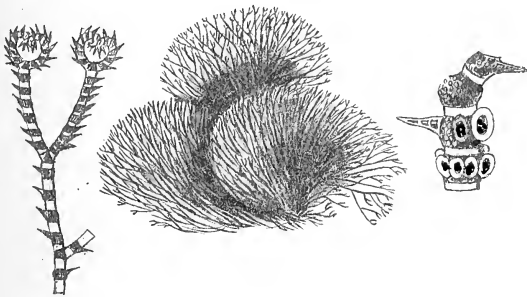
Ceramium flabelligerum, J. Ag.

239.



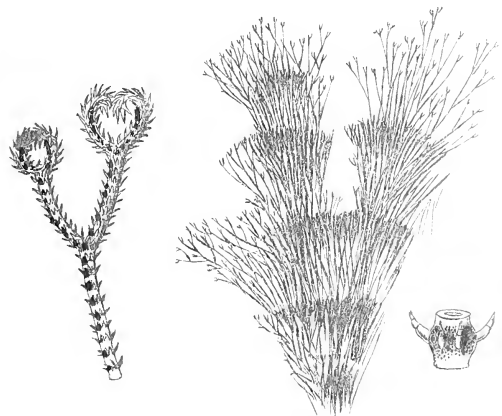
Ceramium echinotum, J. Ag.

240.



Ceramium acanthocornu, Lamour.

241.



Ceramium ciliatum, Duching.

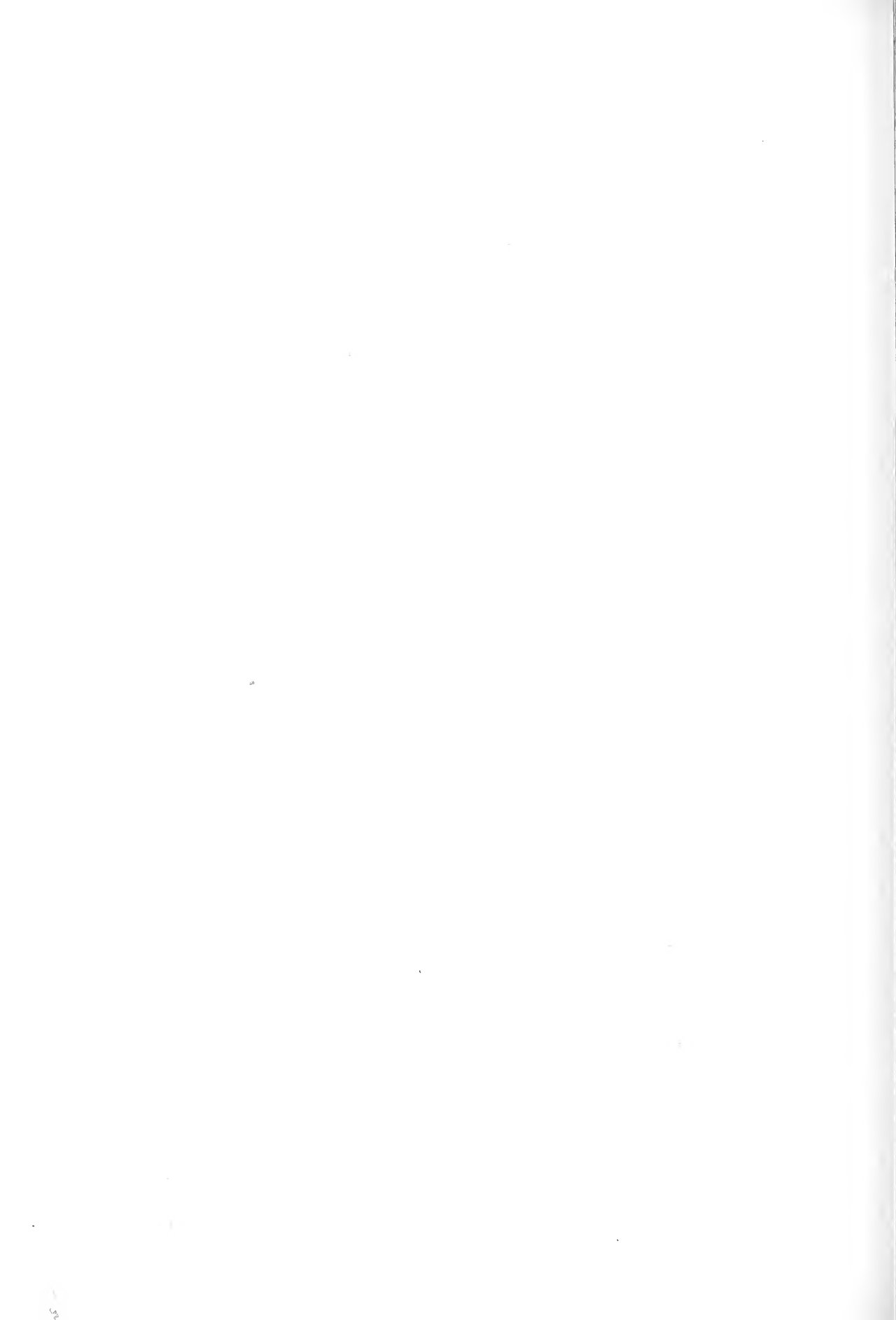


PLATE LIII.

Fig. 242. CERAMIUM RUBRUM.

Colour. Sometimes clear red, sometimes darker; brownish-yellow and white in decay; on examination, of different shades.

Substance. Firm when fresh; soon turning flabby; giving out a pleasant smell.

Character of Frond. Tufts of jointed threads (*filaments*). *Filaments* sometimes coarse, sometimes slender; becoming finer upwards from the base; much and irregularly branched in a partly forked, partly alternate manner; set throughout more or less with once-forked, or many-times-divided, often *secund* branchlets. Tips hooked in.

Joints. Coloured throughout red, but in different shades. Darkest at, and near, the partition-lines (*dissepiments*), which are always slightly contracted, and in drying often shrink considerably.

Measurement. From 2 to 12 inches long.

Fructification. Of two kinds. 1. Minute *spores* in globose *capsules*, with two or three short, curved branchlets underneath; mostly borne on the side-branchlets. 2. *Tetra-spores* set round the joints.

Habitat. Our coasts generally. In pools from high to low-water mark, and beyond. Very common.

No description can include all the varieties of this most variable plant, but whether dark or pale, bright or dingy, it is coloured throughout, though in shades; and as there is but one other *un-thorned* British *Ceramium* (*C. botryocarpum*) in which this is the case, the detection of delusive varieties is not so difficult as may be thought. From *C. botryocarpum* it differs entirely in its capsular fruit.

Fig. 243. CERAMIUM BOTRYOCARPUM.

Colour. A dull purplish-red, fading to green and yellow; on examination, of different shades.

Substance. Rigid.

Character of Frond. Tufts of jointed threads (*filaments*). *Filaments* crooked at the base; rather coarse; becoming gradually finer upwards; much and irregularly branched; in a sometimes forked, sometimes alternate manner; closely set with numerous short, simple, or once or twice divided branchlets. Tips straight.

Joints. Coloured throughout dull purplish-red, but in different shades. Darkest at, and near, the partition-lines (*dissepiments*), which are always slightly contracted, and in drying shrink considerably.

Measurement. From 2 to 6 inches long.

Fructification. Of two kinds, but only one thoroughly made out. *Tetra-spores* set round the joints. The other consists of minute dark fruit-warts heaped together in roundish clusters; *sessile* on the branchlets. Occasionally a true *capsule*, with two or three branchlets underneath, has been met with.

Habitat. Our coasts generally. On rocks, &c. between tide-marks. Common.

Besides the clumsy and unusual fruit, this plant is darker than *C. rubrum*, and more purple. Moreover, the tips of all the branchlets are straight, instead of hooked in.

Fig. 244. GRIFFITHSIA EQUISETIFOLIA.

Colour. Properly, a deep or dark rose-red; often brownish.

Substance. Soft and spongy; yet firm.

Character of Frond. Thick cylindrical stems and branches; several times re-branched in a loose irregular manner; everywhere surrounded and densely clothed by rings (*whorls*) of tiny, incurved, many-times forked, jointed branchleteens (*ramelli*), set at very short, regular intervals. The branchleteens about one-tenth of an inch long, and overlapping each other. Branches and branchlets, all tapering greatly to both ends.

Measurement. From 3 to 8 inches long.

Fructification. Of two kinds. 1. Minute *spores* in clustered *capsules*, with a circle of special curved branchleteens folding over them; borne on the tip of a shortened branch. 2. *Tetraspores* attached to the inside of another set of special curved branchleteens.

Habitat. Southern, S.-Eastern, and Western shores of England and Ireland. Frequent. Rare in Scotland.

Now *Halurus equisetifolius*.

Fig. 245. SPYRIDIA FILAMENTOSA.

Colour. A dull red, fading to brownish.

Substance. Soft, but not gelatinous. Stems firmly elastic.

Character of Frond. Thread-shaped (*filiform*); tufted; much branched. Stems nearly opaque; with an obscure appearance of joints. Branches spreading, many times compounded; more or less beset, the younger ones especially, with very minute, hair-like, simple or subdivided, jointed branchleteens.

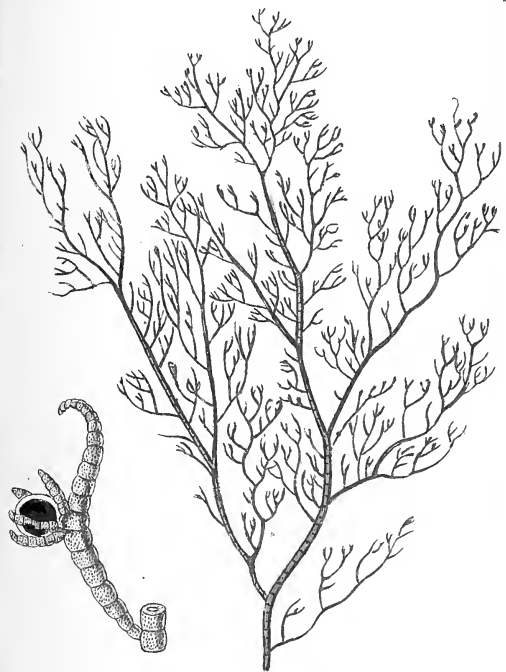
Measurement. From 2 to 8 inches long.

Fructification. Of two kinds. 1. Minute *spores* in stalked, gelatinous, double *capsules*, with three or four special branchleteens underneath. 2. External *tetraspores*, *sessile* on the branchleteens.

Habitat. Southern shores of England. Blackgang, Isle of Wight. Holyhead. On rocks near low-water mark.

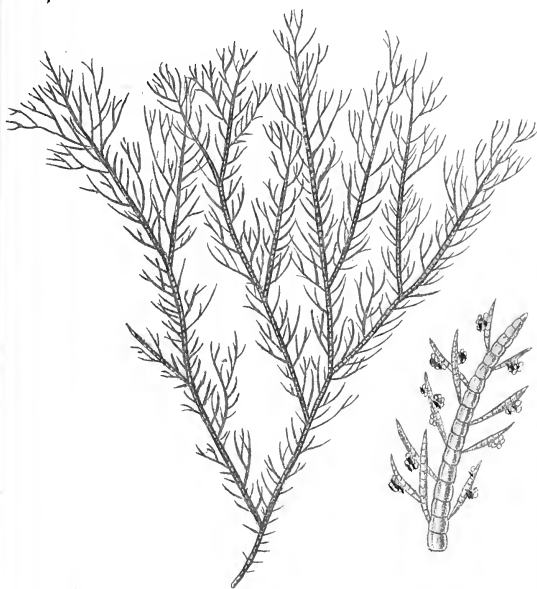
More plentiful in the Channel Islands, and along the French coast, than on the shores of England, where the specimens are of a brownish colour, and not finely grown.

242.



Ceramium rubrum, Ag.

243.



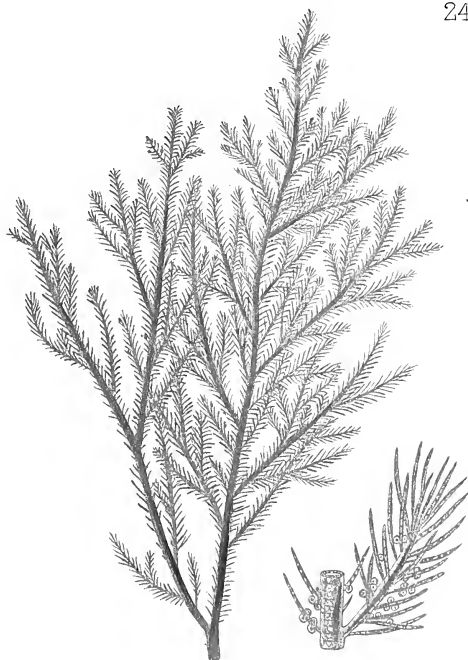
Ceramium botryocarpum, Griff.

244.



Griffithsia equisetifolia, Ag.

245.



Spyridia filamentosa, Harv.

PLATE LIV.

Fig. 246. GRIFFITHSIA SECUNDIFLORA.

Colour. A fine rich crimson.

Substance. Gelatinous, but firm.

Character of Frond. Tufts of distinctly jointed threads (*filaments*). *Filaments* robust (decidedly thicker than a hog's bristle!), very nearly the same thickness throughout; each stem simple at first, irregularly forked upwards; the last divisions often close; spreading wedge-wise (see magnified bit), forming a circular outline. Angles of branching (*axils*) very narrow. Branchlets very upright. Tips very blunt.

Measurement. From 4 to 8 inches long.

Fructification. Has not yet been seen in Britain.

Habitat. Plymouth. On rocks at extreme low-water mark. Very rare.

The robust stems, strongly marked joints (quite obvious to the naked eye, especially when dried), very narrow *axils*, upright branching, and remarkably blunt tips, distinguish this from every other *Griffithsia*.

Fig. 247. GRIFFITHSIA SIMPLICIFILUM.

Colour. A fine pinky-red.

Substance. Soft and spongy, but firm.

Character of Frond. Thickish, cylindrical stems and branches, once or twice re-branched in a loose, irregular manner; surrounded and densely clothed by rings (*whorls*) of tiny, straight, overlapping, jointed branchleteens (*ramelli*), once forked near the base (see magnified bit). Branches and branchlets tapering greatly to the tips; the latter often bare of branchleteens below, but generally clothed with them near the top.

Measurement. From 4 to 8 inches long.

Fructification. Not observed; but no doubt like that of *G. equisetifolium*.

Habitat. Coasts of Norfolk and Wicklow. On rocks, &c. near low-water mark, and at a greater depth. Very rare.

Now *Halurus simplicifilum*. Probably only a slender, drawn-out variety of *G. equisetifolia*. The points of *differentiation* are, that it is less re-branched; that the branchleteens are straighter and only once forked; and that the whole plant is more slender, and perhaps of a brighter colour. But intermediate specimens are constantly found. For other *Griffithsias* see Plate LV.

Fig. 248. SEIROSPORA GRIFFITHSIANA.

Colour. Beautifully rosy.

Substance. Delicately soft.

Character of Frond. Thread-like (*filamentous*); jointed; solitary, or tufted; excessively branched. Stem as thick as a hog's bristle below; becoming gradually finer upwards; undivided (generally); furnished with alternate, slender, undivided, longish, almost horizontally set branches. Branches becoming finer upwards; clothed throughout with short, soft, hair-like, many-times-forked branchlets; spreading to every side. Last divisions cobwebby.

Joints. Obscure in the stem and branches, which are opaque and veiny; visible (when examined through the microscope) in the branchlets.

Measurement. From 2 to 6 inches long.

Fructification. Only one kind known. *Tetraspores* in bead-like cells strung together; formed in a few divisions of the last branchlets; looking like ruby drops.

Habitat. A few places on the south and west coasts. On rocks, &c. in very deep water. Very rare.

Dr. Harvey now includes this plant among the *Callithamnions*. It is the *Callithamnion seirospermum* of his "Nereis Boreali-Americana." A much slenderer form with the so-called *scirosporian* fruit has been found at Douglas. Possibly, therefore, this mode of fructification is only what gardeners call a *sport*.

Fig. 249. WRANGELIA MULTIFIDA.

Colour. A fine, transparent rose-red; soon fading.

Substance. Soft; elastic.

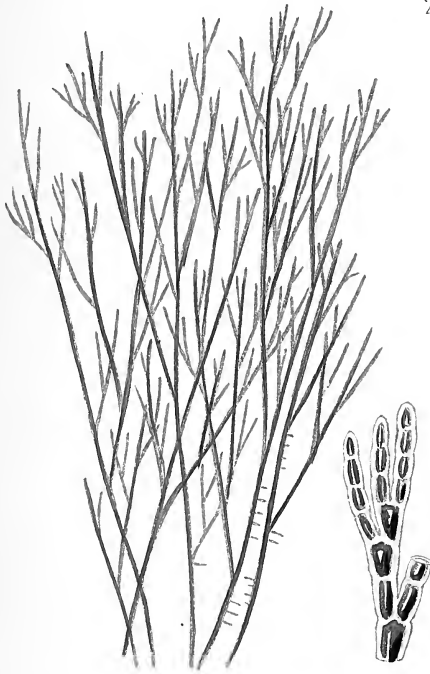
Character of Frond. Thread-like (*filamentous*); jointed; stem and branches. Stem the thickness of a hog's bristle, and undivided throughout; furnished on each side with long, simple, alternate, almost horizontally-set branches. These re-branched with another series which are occasionally forked or re-branched. Each joint of stem, branches, and branchlets beset, either in opposite pairs or all round (*whorled*), by numerous, short, slender, forked, jointed branchleteens (*ramelli*); which are sometimes long, simple, and hair-like; sometimes short and many times divided.

Measurement. From 4 to 6 inches long.

Fructification. Of two kinds. 1. Clusters of spores in globose, stalked capsules; enfolded by special, slender branchleteens (*ramelli*). 2. *Tetraspores* minute, oval, external; sessile on the branchleteens.

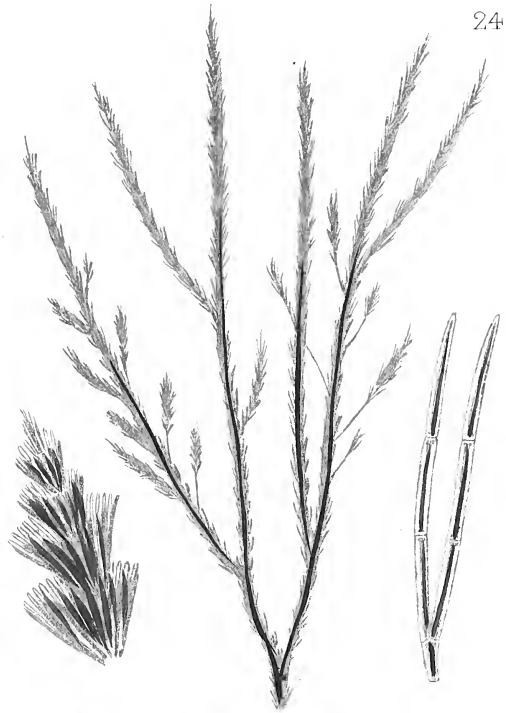
Habitat. South of England. West of Ireland and Scotland. On the perpendicular sides of rocks in pools near low-water mark, under the shade of other sea-weeds. Rare.

246.



Griffithsia secundiflora, J. Ag.

247.



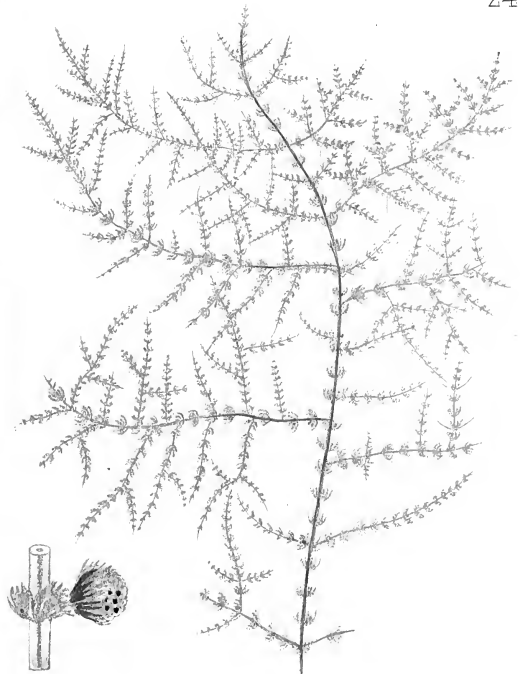
Griffithsia simplicifilum, Ag.

248.



Wrangelia multifida, J. Ag.

249.



Seirospora Griffithsiana, Harv.

PLATE LV.

Fig. 250. GRIFFITHSIA BARBATA.

Colour. A beautiful, clear, rose-red; very soon given out in fresh water.

Substance. Soft; gelatinous; tender; soon decomposing in the air, and after a few minutes' immersion in fresh water.

Character of Frond. Dense tufts of jointed threads (*filaments*); forming a circle when spread out. Filaments slender below; becoming still more so above; repeatedly forked; each joint slightly swollen upwards; the last few furnished with long, opposite, or surrounding (*whorled*) hair-like, jointed branchleteens, on which the *tetraspores* are borne.

Measurement. From 2 to 3 inches long.

Fructification. Of two kinds. 1. Minute *spores* in globose, stalked *capsules*; enfolded by special, slender branchleteens (*ramelli*). 2. *Tetraspores*, globose, borne on the hair-like, jointed branchleteens.

Habitat. The coasts of the British Channel. Jersey, &c. On the smaller algæ in tide-pools. Very rare.

Fig. 251. GRIFFITHSIA DEVONIENSIS.

Colour. A beautiful, clear, rose-red; very soon given out in fresh water.

Substance. Soft; gelatinous; tender; soon decomposing in the air, and after a few minutes' immersion in fresh water.

Character of Frond. Dense tufts of jointed threads (*filaments*); forming a circle when spread out. Filaments very slender throughout; repeatedly forked; the lower angles of branching (*axils*) wide-spread; the upper narrow; the lower branches often throwing out root-like fibres which connect the filaments together below. Partition-lines (*dissepiments*) contracted.

Measurement. From 2 to 3 inches long.

Fructification. Only one kind observed. *Tetraspores* on the inner side of special branchleteens, which surround the partition-lines (*dissepiments*) of the joints; always below the last forkings.

Habitat. South coasts of England. Muddy sea-shores in deep water. Rare.

Fig. 252. GRIFFITHSIA CORALLINA.

Colour. A beautiful, clear, rose-red; which is very soon given out in fresh water; fading very quickly.

Substance. Soft; gelatinous; tender; soon decomposing in the air, and after a few minutes' immersion in fresh water.

Character of Frond. Tufts of strongly marked, jointed threads (*filaments*); forming a circular outline when spread out. Filaments more robust even than those of *G. secundiflora*; repeatedly and nearly regularly forked; the angles of branching (*axils*) wide-spread; divisions more distant below, very close above; each joint swollen upwards, pear-shaped; contracted at the base.

Measurement. From 2 to 4 inches long.

Fructification. Of two kinds. 1. Minute *spores* in roundish *capsules*, enfolded by special, slender branchleteens; *sessile* on the sides of the branches. 2. *Tetraspores* on the inner side of special branchleteens surrounding the partition-lines (*dissepiments*) of the joints.

Habitat. Our coasts generally. On rocks near low-water mark; generally in deep pools. Not uncommon.

Fig. 253. GRIFFITHSIA SETACEA.

Colour. A bright transparent crimson ; which is given out very soon in fresh water.

Substance. Remarkably crisp and firm when fresh ; soon becoming flabby and soft on exposure.

Character of Frond. Tufts of distinctly marked, jointed threads (*filaments*), forming a more or less rounded outline. Filaments as thick as hogs' bristles ; very straight ; irregularly forked ; angles of branching (*axils*) narrow ; lesser branches sometimes opposite ; occasionally throwing out below a few root-like fibres, which connect the filaments together.

Measurement. From 3 to 6 inches long.

Fructification. Of two kinds. Minute *spores* in stalked, mostly double, *capsules* ; surrounded by enfolding branchleteens. 2. *Tetraspores* crowded on the inner sides of special enfolding branchleteens.

Habitat. Our shores generally. On rocks, &c. between tide-marks under the shade of large algæ. Common.

Fig. 254. CALLITHAMNION PLUMULA.

Colour. A beautiful rose-red.

Substance. Delicately soft and tender.

Character of Frond. Tufts of jointed threads (*filaments*) very much branched. Stems undivided or somewhat forked ; furnished with alternate or irregular slender branches ; the upper ones longest and most divided ; all the divisions and branches at one level (*distichous*) ; every joint bearing a pair of short, horizontal, or back-curved, exactly opposite branchlets, whose upper margin is clothed with a second set ; these sometimes with a third ; all regularly set like the teeth of small combs (*pectinated*).

Joints. Visible throughout (when examined through the microscope).

Measurement. From 2 to 5 inches long.

Fructification. Of two kinds. 1. Minute *spores* in large, dark-red, double *capsules* ; *sessile* on the main branches. 2. Minute, globose *tetraspores* borne on the tips of the then shortened branchleteens.

Habitat. Our coasts from Orkney to Devon, but in the warmer stations. Dublin, &c. On rocks, &c. near low-water mark. Not uncommon.

Fig. 255. CALLITHAMNION CRUCIATUM.

Colour. A brownish-red ; soon fading to yellowish.

Substance. Soft and *flaccid* (limp).

Character of Frond. Dense tufts of jointed threads (*filaments*) ; branched, but rather sparingly. Stems irregularly divided into, or furnished with, a number of long, almost simple branches, which are sometimes re-branched. Each joint throughout, clothed with one or sometimes two pairs of slender, upright, sometimes simple, oftener re-branched, branchleteens. These so crowded at the tips that they present a darkened appearance, like the eye in a peacock's tail.

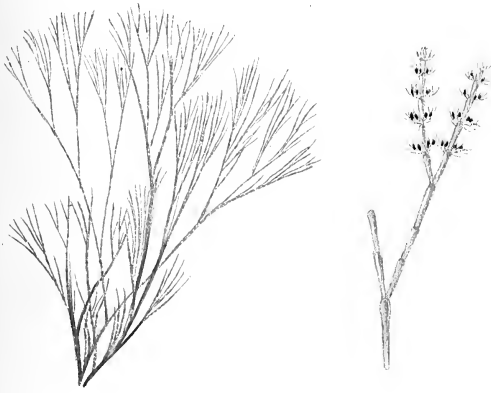
Joints. Visible throughout (under the microscope).

Measurement. From 1 to 2 inches long.

Fructification. Only one kind known. *Tetraspores*, dark-red, *sessile* on the (then) shortened branchleteens.

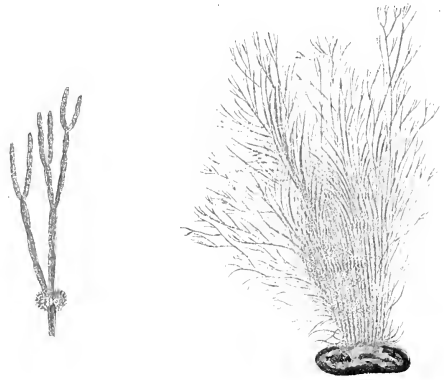
Habitat. South of England and south and west of Ireland. On mud-covered rocks near low-water mark. Rare.

250



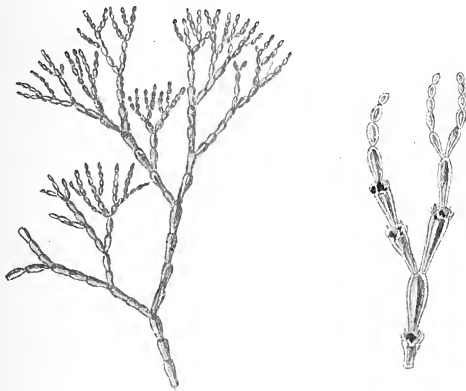
Griffithsia barbata, Ag.

251.



Griffithsia Devoniensis, Harv.

252.



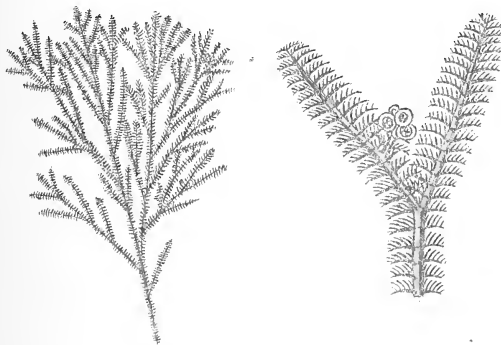
Griffithsia corallina, Ag

253



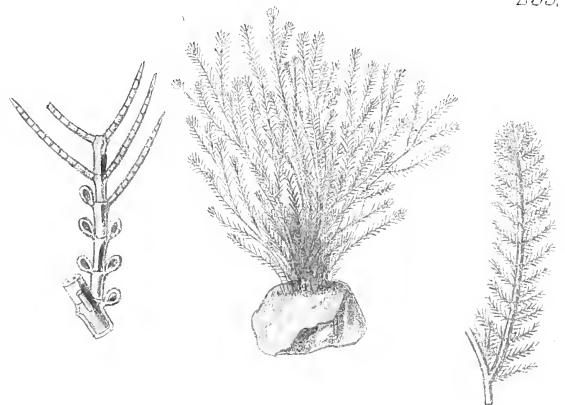
Griffithsia setacea, Ag

254



Callithamnion plumula, Lyngb.

255.



Callithamnion cruciatum, Ag.

PLATE LVI.

Fig. 256. CALLITHAMNION BARBATUM.

Colour. A brownish or full red.

Substance. Membranaceous, and somewhat rigid.

Character of Frond. Dense tufts of jointed threads (*filaments*); irregularly branched. Stems rising from creeping fibres bearing opposite, or sometimes alternate, branches. These long, and either simple or clothed for half their length (and irregularly here and there) with minute, opposite, spine-like branchlets, which die down in winter.

Joints. Visible throughout*; deeply coloured.

Measurement. From 1 to 2 inches long.

Fructification. Only one kind known. Narrow oval *tetraspores*, *sessile* on the lowermost joints of the branchlets.

Habitat. Ilfracombe, Penzance, and Weymouth. On mud-covered rocks within tide-marks. Very rare.

* "When examined under the microscope," must always be understood in speaking of these delicate plants.

Fig. 257. CALLITHAMNION BRODLÆI.

Colour. A brownish-red.

Substance. Soft generally; stem elastic.

Character of Frond. Thread-like (*filamentous*); jointed; tufted or single; much branched. Stems hogs'-bristly below, becoming finer above; generally simple; furnished throughout with long, alternate, wide-spread branches, the lowermost longest. These bearing a secondary set, one to each joint, which spring in succession from each side of the stem (*quadri-fariously*); the lowermost always longest; so that each branch has a spear-shaped outline. Secondary branches once or twice re-branched in the same way. Last branchlets somewhat back-curved; bearing towards their tips a few *secund* branchlets.

Joints. Obscure in the stems, which are somewhat opaque and veiny; visible in the branches and branchlets.

Measurement. From 1 to 3 inches long.

Fructification. Of two kinds. 1. Minute *spores* in large, roundish, solitary, or double *capsules*; *sessile* on the branchlets. 2. Globose *tetraspores*, *sessile* on the branchlets.

Habitat. Our coasts generally. On algæ near low-water mark. Rare.

Fig. 258. CALLITHAMNION BRACHIATUM.

Colour. Brownish-red; becoming darker in drying.

Substance. Rigid for so delicate a plant.

Character of Frond. Thread-shaped (*filiform*); jointed; tufted or single; much branched. Stem the thickness of a hog's bristle; simple, or nearly so; set with branches which spring in succession from all sides (*quadri-fariously*). Branches often re-branched in the same way; last set but one, slender, drawn out; furnished with short, alternate tufts of branchlets. Branchlets upright, awl-shaped; not tapering to the base, but gradually upwards to a fine point.

Joints. Obscure in the main stems, which are somewhat opaque and veiny; visible in the last branches and branchlets.

Measurement. From 1 to 1½ inches long.

Fructification. Only one kind known. Minute, oval *tetraspores*, *sessile* near the tips of the branchlets.

Habitat. Our coasts generally. Parasitic on the larger algæ.

Probably only a slender variety of *C. tetragonum*.

Fig. 259. CALLITHAMNION TETRICUM.

Colour. A dull purplish-red or brown.

Substance. Rigid and harsh, but very fragile when once dried.

Character of Frond. Thread-shaped (*filiform*); jointed; tufted or single; much branched. Stems short and shaggy; dividing into several principal branches. Branches several times re-branched; ropy; closely furnished throughout with straight, rigid, hair-like branchlets; some simple; some clothed with short, regularly-set, alternate branchleteens.

Joints. Obscure in the stems; visible in all the branches.

Measurement. From 2 to 8 inches long.

Fructification. Of two kinds. 1. Minute spores in large oval capsules, generally in pairs, sessile near the tips of the branchleteens. 2. Minute, oval tetraspores, sessile on little stalks which spring from the branchleteens.

Habitat. South of England. South and west of Ireland. On perpendicular sides of rocks, between tide-marks. Frequent.

Fig. 260. CALLITHAMNION ROSEUM.

Colour. A fine purple-red when young; when old, brownish; becoming brighter in fresh water.

Substance. Very soft.

Character of Frond. Tufts of slender-jointed threads (*filaments*); excessively and loosely branched; often entangled. Stems set throughout with long, wavy, spreading branches, which are re-branched in a similar way. Secondary set furnished with branchlets, beautifully and regularly plumed like a feather with branchleteens.

Joints. Visible throughout in young plants; in older, the stems opaque and full of veins.

Measurement. From 3 to 4 inches long.

Fructification. Of two kinds. 1. Minute spores in clustered capsules, sessile on the branchlets. 2. Oval tetraspores, sessile on the inner side of the branchleteens.

Habitat. Our shores generally. On rocks and the larger *Fuci*, near low-water mark. Also in estuaries and muddy places. Not uncommon.

Fig. 261. CALLITHAMNION TRIPINNATUM.

Colour. A fine crimson.

Substance. Soft and delicate; closely adhering to paper.

Character of Frond. Tufts of jointed threads (*filaments*); much branched; the whole plant at one level. Stems furnished throughout with irregularly alternate branches. Branches set throughout with regularly alternate branchlets, beautifully plumed like feathers. Upper branchleteens, longish; lower, short, or altogether wanting; one, however, always rising at the base of each branchlet.

Joints. Visible throughout, even under a pocket lens.

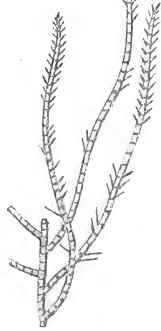
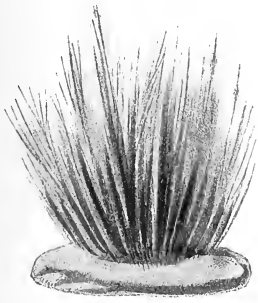
Measurement. From 1 to 2 inches long.

Fructification. Only one kind observed. Oval tetraspores, sessile on the branchleteens.

Habitat. West of Ireland. On rocks at extreme low-water mark. Very rare.

The solitary branchleteen rising from the angles of branching (*axils*) distinguishes this plant from *C. Borreri*, which it otherwise much resembles.

256.



Callithamnion barbatum, Ag.

257.



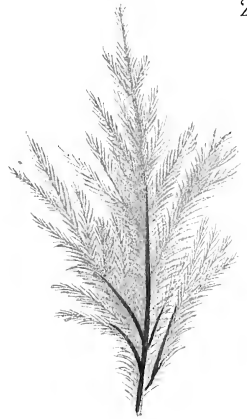
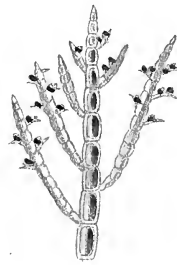
Callithamnion Brodiaei, Harv.

258.



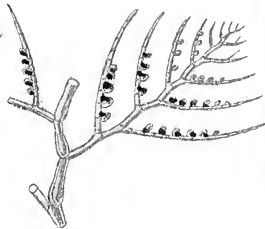
Callithamnion brachiatum, Bannan.

259



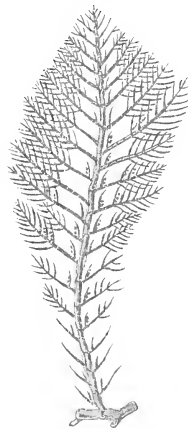
Callithamnion tenuicum, Ag.

260.



Callithamnion roseum, Lyngb.

261.



Callithamnion urpinnatum, Ag.

PLATE LVII.

Fig. 262. CALLITHAMNION ARBUSCULA.

Colour. Dark clarety-red, or brown.

Substance. Stems gristly; branchlets very soft.

Character of Frond. Thread-like (*filamentous*); jointed; single or tufted; excessively branched; bushy. Stem thick at base; often shaggy with fibres; bare at first; then set with irregular, alternate branches. Branches twice or thrice re-branched with shorter ones, which spring from all sides of the stem (*quadrifarious*); and are all densely clothed with minute, overlapping branchlets, also *quadrifarious*. Branchlets plumed with pointed, spreading or back-curved, simple or forked branchleteens, springing from each joint.

Joints. Only visible in the branchlets and branchleteens.

Measurement. From 3 to 8 inches long.

Fructification. Of two kinds. 1. Minute spores in large roundish capsules; sessile, two or three together on the branchlets. 2. Globose tetraspores, sessile on the inner side of the last branchlets.

Habitat. Western shores of Scotland and Ireland, abundant. East coast of Scotland, rare. Filey, plentiful on the north side of the bridge. On rocks and mussel-shells, &c., from half-tide level to low-water mark.

Not found on the same stations as *C. spongiosum*.

Fig. 263. CALLITHAMNION FLOCCOSUM.

Colour. A bright purplish-lake.

Substance. Very soft and flabby.

Character of Frond. Dense tufts of hair-like, jointed threads (*filaments*) much branched at intervals. Stems very slender; irregularly divided into several principal branches, which are again once or twice forked (*dichotomous*). Branches naked, or furnished at rather remote intervals with short, many-times-divided (almost tufted), alternate, lesser branches. Every joint of the whole plant bearing a pair of exactly opposite, very short, very slender, pointed branchleteens.

Joints. Visible throughout.

Measurement. From 1 to 5 inches long.

Fructification. Only one kind observed. Oval tetraspores borne on the branchleteens near their base.

Habitat. North of Scotland (Orkney, Aberdeen, &c.). On rocks near low-water mark. Very rare.

The fringing branchleteens of this plant form so distinct a character that it is impossible to mistake it for any other species.

Fig. 264. CALLITHAMNION TETRAGONUM.

Colour. A full or brownish-red, becoming darker in drying; but occasionally, when young, brighter; turning orange in fresh water.

Substance. Rigid; elastic.

Character of Frond. Thread-like (*filamentous*); jointed; single or tufted; much branched; thicker than hogs' bristles below; becoming finer upwards. Set with branches which spring in succession from all sides of the stem (*quadrifarious*); the lowermost longest; several times re-branched in a similar manner; the last set but one densely clothed with short, alternate, wide-spread tufts of branchleteens. Branchleteens incurved; tapering at base; *suddenly* pointed at top; springing from all sides.

Joints. Obscure in the stems. Visible in all the branches.

Measurement. From 3 to 6 inches long.

Fructification. Of two kinds. 1. Minute *spores* in large, oval, single or double capsules; borne on a (then) shortened branchleteen. 2. *Tetraspores* excessively minute; *sessile* near the tips of the same.

Habitat. Our coasts generally. On the larger algæ near low-water mark. Common.

Fig. 265. CALLITHAMNION SPONGIOSUM.

Colour. A dull reddish-brown; quite without gloss.

Substance. Soft and flabby; holding water like a sponge.

Character of Frond. Thread-like (*filamentous*); jointed; single or tufted; much branched. Stems shrubby; branches long; wavily curved; spreading in every direction; thickly clothed (especially upwards), with one or more secondary, similar sets. These furnished throughout with branchlets; the branchlets crowded (especially upwards) with repeatedly forked (*dichotomous*) branchleteens, which, springing from all sides, give each division a rounded, bushy character. Angles of branching (*axils*) wide.

Joints. Obscure in the main stems, which are more or less opaque and veiny. Visible in all the branches.

Measurement. From 2 to 4 inches long.

Fructification. Of two kinds. 1. Minute *spores* in roundish or divided (*lobed*) capsules; *sessile* on the stems of the branchlets. 2. *Tetraspores*, solitary; oval; *sessile* in the angles of branching (*axils*).

Habitat. Our coasts generally, in the warmer stations. Isle of Man. Scilly Isles. West of Ireland, &c. On perpendicular rocks near low-water mark; and on other algæ. Not uncommon.

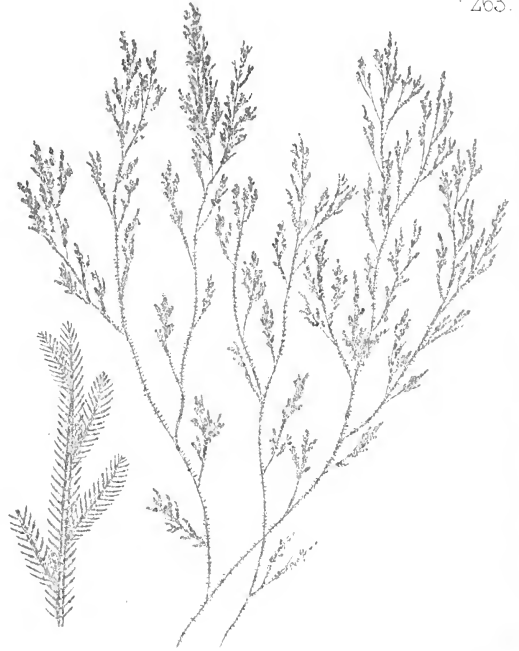
Not found in the same stations as *C. arbuscula*.

262.



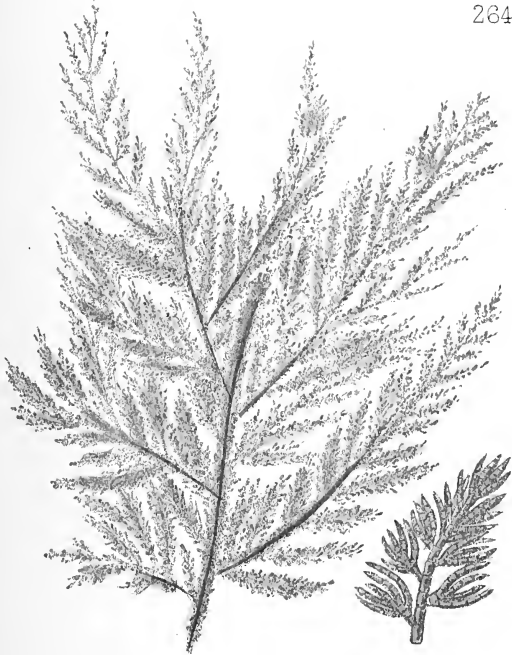
Callithamnion arbuscula, Lyngb.

263.



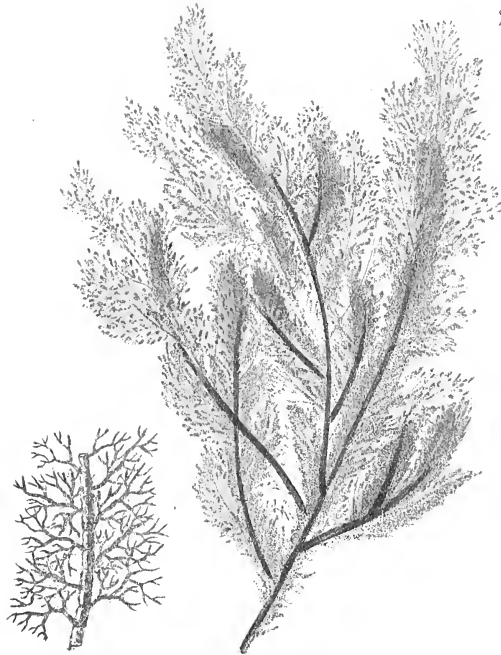
Callithamnion floccosum, Ag.

264.



Callithamnion tetragonum, Ag.

265.



Callithamnion spongiosum, Harv.

PLATE LVIII.

Fig. 266. CALLITHAMNION TURNERI.

Colour. A fine rose-red.

Substance. Soft but firm.

Character of Frond. Dense round tufts of jointed threads (*filaments*) rising from creeping fibres; branched. Stems upright; simple or slightly branched; once or twice plumed like a feather (*pinnate*), with short opposite branchlets (see magnified bit), very regularly arranged; the lowermost rather the longest, gradually diminishing upwards.

Joints. Visible throughout.

Measurement. From an inch to $1\frac{1}{2}$ long.

Fructification. Of two kinds. 1. Minute spores in stalked, oval capsules, borne on the branchlets enfolded by branchleteens (*involutrated*). 2. Globose tetraspores, either stalked or sessile, clustered or solitary, on the inner sides of the branchlets.

Habitat. Our coasts generally. Parasitic on several algæ between tide-marks. Common.

Fig. 267. CALLITHAMNION PLUMA.

Colour. Crimson.

Substance. Soft.

Character of Frond. Dense, very short tufts of jointed threads (*filaments*) rising from creeping fibres; sparingly branched. Stems upright; simple or slightly branched. Branches naked below, the upper half plumed like a feather, with short or long, very upright, close-set branchlets.

Joints. Visible throughout.

Measurement. One-quarter to $\frac{1}{2}$ an inch high.

Fructification. Only one kind observed. Globose tetraspores, stalked or sessile; clustered or solitary; often at the tips of the branchlets.

Habitat. The warm stations on our coasts. Jersey. Miltown Malbay. Bantry Bay, &c. Parasitic on other algæ; generally on the stems of *Laminaria digitata*. Rare.

Fig. 268. CALLITHAMNION HOOKERI.

Colour. A brownish or rosy-red; the two tints often found on the same specimen.

Substance. Soft.

Character of Frond. Thread-like (*filamentous*); jointed; single or tufted. Stem as thick as a hog's bristle; closely furnished throughout with long, alternate, simple branches, which again bear a second or third set; sometimes springing from all sides of the stem; all set with very wide-spread branchlets, plumed like feathers; these re-branchleted with a second very short horizontal set.

Joints. Distinct only in the lesser branches and the branchlets.

Measurement. From 1 to 3 inches long.

Fructification. Of two kinds. 1. Minute spores in large oval capsules; sessile here and there on the branches. 2. Globose tetraspores; sessile along the inner sides of the branchlets near the base; either single or two or three together.

Habitat. Our coasts generally. On rocks and algæ between tide-marks. Not uncommon.

A rather woolly variety of this variable plant was once considered a separate species; *C. lanosum*.

Fig. 269. CALLITHAMNION BYSSOIDEUM.

Colour. A beautiful rose-red.

Substance. Gelatinous; exceedingly soft and delicate; rather glossy when dry.

Character of Frond. Dense tufts of excessively fine, jointed threads (*filaments*) very much branched. Stems very slender, much divided from the base, either into several principal branches, bearing a great number of lesser ones; or wholly composed of almost cobweb-like branches, inextricably entangled together. Branches forming a lanceolate outline; clothed with long, slender alternate branchlets, plumed like a feather, with a second lesser set, and these with branchleteens; all alternate.

Joints. Distinct throughout.

Measurement. From 1 to 3 inches long.

Fructification. Of two kinds. 1. Minute *spores* in large, oval, twice-or-thrice-divided *capsules*; near the ends of the branches. 2. Oval *tetraspores*; mostly solitary; *sessile* near the base of the branchleteens.

Habitat. Our coasts in several places. Parasitic on other algæ; on *Codium tomentosum* especially. Near low-water mark. Not uncommon.

Like *C. roseum*, but much more cobwebby.

Fig. 270. CALLITHAMNION POLYSPERMUM.

Colour. Dull rose-red, or purplish.

Substance. Soft.

Character of Frond. Dense round tufts of slender, jointed threads (*filaments*); loosely, very much branched. Stems irregularly divided; somewhat naked below; furnished with spreading branches above. Branches several times divided; set with lesser branches; the larger ones bearing short, spine-like, alternate branchlets; some quite simple, others re-branched, forming feather-like plumes; the plumes long and narrow; the upper ones occasionally more compound than those below. Branchlets spreading, occasionally even turned back.

Joints. Visible throughout.

Measurement. From 1 to 3 inches in diameter.

Fructification. Of two kinds. 1. Minute *spores* in large round *capsules*; *sessile* on the branchlets. 2. *Tetraspores* set along the inner sides of the plumes of the branchlets; very abundant.

Habitat. Our coasts generally. On algæ between tide-marks. Common.

Fig. 271. CALLITHAMNION FASCICULATUM.

Colour. A fine purple-red.

Substance. Soft.

Character of Frond. Tufts of very slender, jointed threads (*filaments*) much and bushily branched. Stems naked at the base, crowded above with long, wavy, very upright branches; their upper half closely plumed like a feather with branchlets. Lowermost branchlets (or plumes) short and simple; upper, long and spreading; re-branched once and again near the tips; producing a blunt outline.

Joints. Obscure in the nearly-opaque main stems. Visible in the branches. Partition-lines (*dissepiments*) contracted.

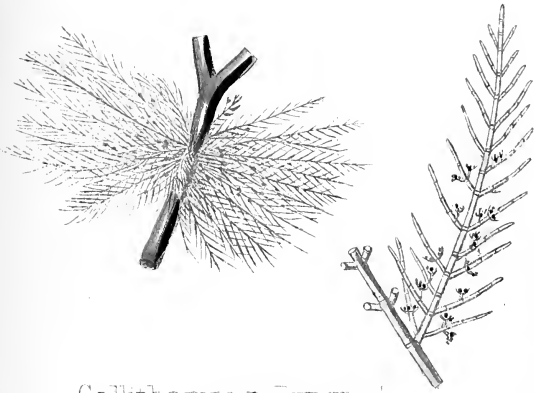
Measurement. Two or 3 inches long.

Fructification. Only one kind observed. Oval *tetraspores* at the base of the *plumes* of the branchlets.

Habitat. Yarmouth, Mr. Borrer.

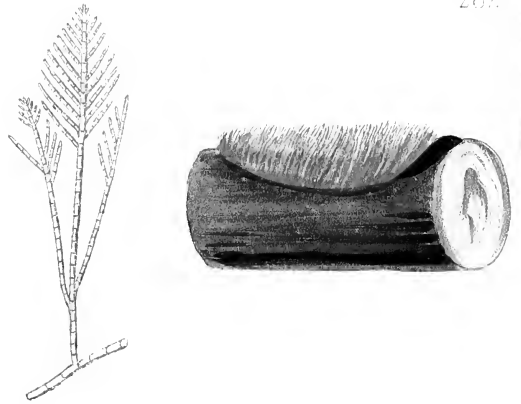
Surely only a "sport" of *C. Borreri*.

267



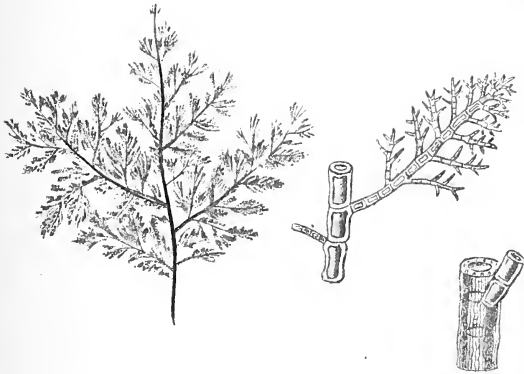
Callithamnion Bunnii, Ag.

268



Callithamnion pluma, Ag.

269



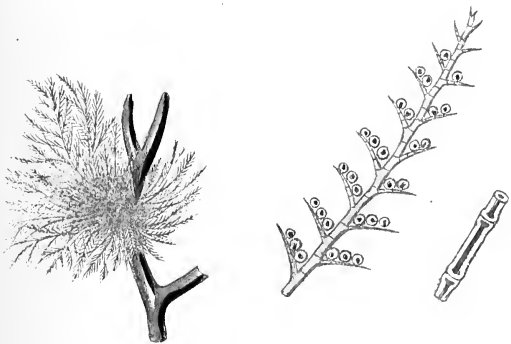
Callithamnion Hookeri, Ag.

269



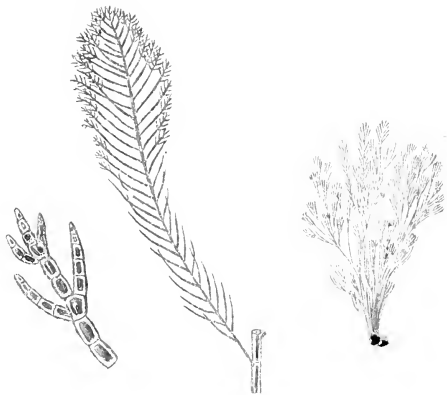
Callithamnion byssoideum, Arn.

270



Callithamnion polyspermum, Ag.

271



Callithamnion fasciculatum, Harv.

PLATE LIX.

Fig. 272. CALLITHAMNION BORRERI.

Colour. A brilliant, deep, or pale rose-red, in different specimens; giving out its colour in fresh water.

Substance. Either rigid or very soft, in different specimens.

Character of Frond. Tufts of jointed threads (*filaments*) very much branched. Stems nearly simple; bare below, or set with only short branches; above, furnished with long, spreading, wavy ones; their upper half clothed with branchlets beautifully plumed like a feather, with straight, wide-spread, alternate branchlets; the lowermost longest. Branchlets simple, or re-plumed near their tips: producing a round, blunted outline.

Joints. Visible throughout.

Measurement. From 1 to 3 inches long.

Fructification. Of two kinds. 1. Minute spores in double capsules; sessile near the tips of the branchlets. 2. Globose tetraspores; sessile on the inner sides of the branchlets.

Habitat. Our coasts generally. Douglas, Hompton, South coast, &c. On rocks near low-water mark. Rather rare.

Fig. 273. CALLITHAMNION AFFINE.

Colour. Pink or red.

Substance. Soft.

Character of Frond. Thread-like (*filamentous*); jointed; much branched; bushy; single or tufted. Main stems furnished with very numerous, long, alternate branches, which are re-branched. Secondary branches long, alternately plumed like a feather with branchlets. Branchlets (or plumes) once plumed with branchlets, which are short and upright below; long and crowded upwards.

Joints. Obscure in the stems, which are opaque and veiny. Visible in the branchlets.

Measurement. Two or 3 inches long.

Fructification. Of two kinds. 1. Minute spores in large, roundish capsules; generally two together. Sessile on the stems of the branchlets. 2. Oval tetraspores; generally solitary; sessile on the lowermost cell of the branchlets.

Habitat. Bute. Once found by Dr. Greville.

Fig. 274. CALLITHAMNION GRACILLIMUM.

Colour. When quite recent, a deep red; becoming rose-red in fresh water; giving out its colour if soaked too long.

Substance. Extremely soft and delicate.

Character of Frond. Tufts of extremely fine, jointed threads (*filaments*); profusely branched. Stems dividing into numerous long, wavy, irregular main branches. Branches set throughout their whole length with a second similar set; these with compound branchlets; the upper ones beautifully plumed and re-plumed, with one, two, or even three sets of gradually diminishing branchlets; the lower shorter, less regular, and less compound. The whole branching at one level as if cut out (*distichous*). Outline of the principal branches broadly egg-shaped, of the upper branchlets long, narrow, lanceolate, pointed, strongly resembling minute fern-leaves.

Joints. Visible throughout.

Measurement. From 1 to 4 inches long.

Fructification. Of two kinds. 1. Minute spores in roundish double capsules; sessile on the principal branches. 2. Minute oval tetraspores on the tips of the (then) shortened branchlets.

Habitat. South and West of England. (Torquay, Milford Haven, Falmouth, Plymouth.) On mud-covered perpendicular rocks and piers near low-water mark. Rare.

Fig. 275. CALLITHAMNION THUYOIDEUM.

Colour. A fine rose-red.

Substance. Soft and limp.

Character of Frond. Tufts (or single plants) of very fine, jointed threads (*filaments*); very much branched. Stems exceedingly slender; nearly simple below, set above with alternate branches. These once or twice re-branched. The lesser ones, and sometimes all, clothed with branchlets, which are beautifully plumed and re-plumed with one, two, or even three sets of gradually-diminishing branchleteens. The whole branching at one level, as if cut out. Outline of the plumed branches very narrow oblong.

Joints. Visible throughout.

Measurement. One or 2 inches long.

Fructification. Of two kinds. 1. Minute spores in large oval capsules; generally sessile on the sides (not at the tips) of the branchlets; very rare. 2. Globose tetraspores borne on the tips of the (then) shortened branchleteens.

Habitat. Our coasts occasionally. Yarmouth, Plymouth, &c. On rocks near low-water mark. Rare.

Fig. 276. CALLITHAMNION CORYMBOSUM.

Colour. A pink or purplish-red.

Substance. Exceedingly soft, limp, and gelatinous; having a fine gloss when dried.

Character of Frond. Thread-like (*filamentous*); jointed; excessively branched. Stem hair-like below; cobweb-fine above (occasionally much more robust); closely set with long, alternate branches. Branches partly divided in a forked manner; partly alternate; re-branched in a similar way. The last series clothed with very compound, alternate branchlets. Branchlets zigzag; set at every joint with cobweb-fine, repeatedly-forked branchleteens, of nearly uniform length; each tip, therefore, forming a roundish outline, something like those of *C. spongiosum*; but not so bushy.

Joints. Visible throughout; even in the stems.

Measurement. From 1 to 3 inches long.

Fructification. Of two kinds. 1. Minute spores in large, double capsules; sessile in the angles of branching (*axils*). 2. Minute, round tetraspores, a single one sessile on one side of the forked branchleteens, immediately below the point where they fork.

Habitat. South and West of England. West of Scotland. Isle of Man. Ireland generally. On rocks, algæ, and *Zostera marina* near low-water mark. Not uncommon.

Fig. 277. CALLITHAMNION FLORIDULUM.

Colour. A purplish-pink.

Substance. Soft and almost spongy.

Character of Frond. Dense tufts of fine, jointed threads (*filaments*), forming a roundish cushion on the rocks. Filaments equally slender throughout; once or twice forked; furnished with a few long, simple or forked, very upright branches; the upper ones sometimes clothed near the top with a few *secund* or alternate, upright branchlets (the lowermost longest), on which the tetraspores are borne.

Joints. Visible throughout under the microscope, or even through a pocket lens, having a peculiar shimmery appearance, from the silvery whiteness of the cell-membrane.

Measurement. About an inch high.

Fructification. Only one kind known. Minute, oval tetraspores, borne on very short, upright branchlets (or stalks), ranged in a *secund* manner along the upper branches.

Habitat. West of Ireland. Orkney. Land's End. Scilly. Isle of Man. On sand-covered rocks near low-water mark. Not uncommon.

272.



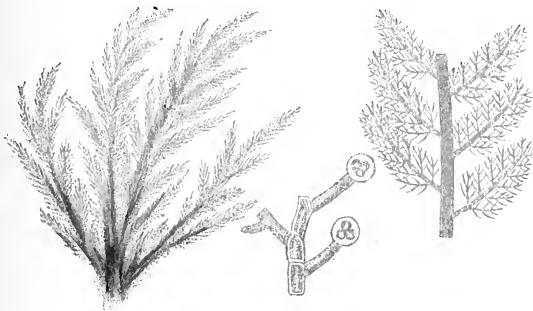
Callithamnion Borren, Ag.

273.



Callithamnion affine, Harv.

274.



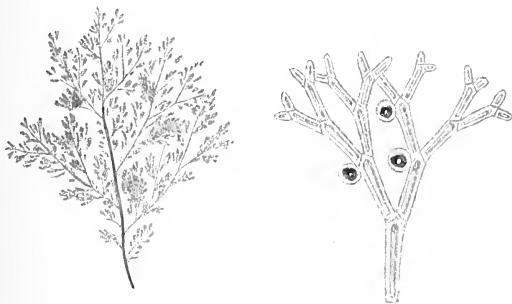
Callithamnion gracillimum, Ag.

275.



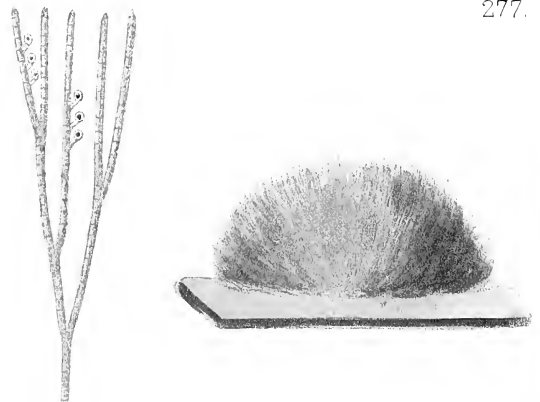
Callithamnion thuyoides, Ag.

276.



Callithamnion corymbosum, Ag.

277.



Callithamnion floridulum, Ag.

PLATE LX.

Fig. 278. CALLITHAMNION ROTHII.

Colour. Deep red or purple.

Substance. Soft and velvety.

Character of Frond. Dense tufts of very short, fine, jointed threads (*filaments*); forming velvety patches on rocks. Filaments very slender; of one thickness throughout, slightly forked, irregularly branched. Branches very upright, rod-like; the upper ones sometimes set with a few *secund* simple or branched branchlets, on some of which the *tetraspores* are borne. Tips pointed.

Joints. Visible throughout.

Measurement. From $\frac{1}{4}$ to 1 inch high.

Fructification. Only one kind known. Small round *tetraspores*, often clustered together, borne on the (then) shortened end-branchlets.

Habitat. Our coasts generally. Spreading over the surface of rocks at half-tide level. Common.

Fig. 279. CALLITHAMNION MESOCARPUM.

Colour. Purplish-red.

Substance. Soft, velvety.

Character of Frond. Tufts of minute, jointed threads (*filaments*), forming a broad, shaggy, purple crust on the rock. *Filaments* rising from creeping fibres, upright, simple or sparingly branched. Branches alternate, very upright; naked, or bearing a few little upright, often *secund* branchlets, on some of which the *tetraspores* are borne.

Joints. Visible throughout.

Measurement. One-fourth or $\frac{1}{6}$ of an inch high.

Fructification. Only one kind known. Oval *tetraspores* borne on the (then) shortened branchlets; often two on a branchlet.

Habitat. Appin. On rocks at low-water mark.

Fig. 280. CALLITHAMNION SPARSUM.

Colour. Purplish-red.

Substance. Soft, velvety.

Character of Frond. Very minute, scattered tufts of fine, jointed threads (*filaments*). Filaments nearly simple, upright, slightly branched upwards. Branches spreading; of unequal lengths, alternate or *secund*; the tips blunt.

Joints. Visible throughout.

Measurement. Scarcely $\frac{1}{10}$ of an inch high.

Fructification. Only one kind known. Bluntly oval *tetraspores*; *sessile* generally in the angles of branching (*axils*).

Habitat. Appin. Milntown Malbay. On old stems of *Laminaria saccharina*, and on *Cladophora rupestris*.

Very little observed, owing to its minuteness; but not uncommon.

Fig. 281. CALLITHAMNION DAVIESII.

Colour. Rose-red.

Substance. Soft.

Character of Frond. Very minute tufts of fine, jointed threads (*filaments*). Filaments very much branched. Branches spreading; curved; of unequal lengths; scattered; bearing little clusters of branchlets at their angles of branching (*axils*); the rest of the stems bare.

Joints. Visible throughout.

Measurement. One-quarter of an inch, or thereabouts, high.

Fructification. Only one kind known. Minute, oval, stalked. *tetraspores* borne on the shortest of the clustered branchlets; single or clustered.

Habitat. Our coasts generally, but preferring warm stations. Parasitic on *Ceramium rubrum* and other algæ; in pools between tide-marks. Not uncommon.

Fig. 282. CALLITHAMNION VIRGATULUM.

Colour. Rose-red.

Substance. Soft.

Character of Frond. Very minute tufts of fine, jointed threads (*filaments*). Filaments once or twice divided; very upright; set with secund, rod-like branches; bearing at each joint a short, blunt, bud-like branchlet; several on one side in succession.

Joints. Visible throughout.

Measurement. One-quarter of an inch, or thereabouts, high.

Fructification. Only one kind known. Minute, oval *tetraspores* borne on the bud-like branchlets, or in their place at the joints.

Habitat. Our coasts generally. On *Ceramium rubrum* and other algæ, between tide-marks. Not uncommon.

Fig. 283. CALLITHAMNION PEDICELLATUM.

Colour. A fine red; easily given out in fresh water.

Substance. Soft.

Character of Frond. Longish tufts of jointed threads (*filaments*) much branched. Filaments as thick as horse-hair, loosely and irregularly divided. Branches furnished with short, alternate clusters of branchlets; sometimes one to each joint, tallest; more or less forked and spreading; their tips very obtuse.

Joints. Visible throughout, and very pellucid.

Measurement. From 2 to 8 inches long.

Fructification. Of two kinds. 1. Minute *spores* in large oval *capsules*, single or in pairs; *sessile* on the stems. 2. Oval or pear-shaped, very dark *tetraspores*, or little colourless stalks rising from the angles of branching (*axils*).

Habitat. Our shores generally. On rocks and wood-work near low-water mark. Frequent.

Now *Corynospora pedicellata*.

278.



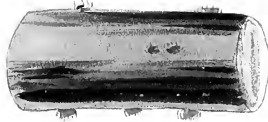
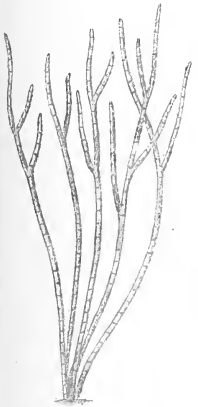
Callithamnion Botini, Lyngb.

279.



Callithamnion mesocarpum, Carn.

280.



Callithamnion sparsum, Harv.

281.



Callithamnion Daviesi, Lyngb.

282.



Callithamnion virgatum, Harv.

283.



Callithamnion pedicellatum, Ag.

PLATE LXI.

Fig. 284. CODIUM BURSA.

Colour. Dark green.

Substance. Stiffly and densely spongy.

Character of Frond. An irregularly round lump; composed of interwoven threads (*filaments*), densely matted together; hollow when old; several, of different ages and sizes, growing together in groups.

Measurement. From 1 to 8 inches in diameter.

Fructification. Little egg-shaped sacs (*sporangia*), containing a dark-green substance, which changes at maturity into seeds (*zoospores*; so called from having at one period a motion as if endowed with animal life); attached to the outer threads (*filaments*) of which the frond is composed.

Habitat. South coast of England. Jersey. Cornwall. Torquay. Not uncommon at Brighton. Very rare generally.

Fig. 285. CODIUM TOMENTOSUM.

Colour. Dark green.

Substance. Soft; densely spongy.

Character of Frond. Cylindrical, or somewhat compressed, smooth stem and branches, often thicker than a swan's quill throughout; more or less repeatedly but irregularly forked; sometimes beset with short side-branches.

Measurement. From 3 to 12 inches long.

Fructification. Little egg-shaped sacs (*sporangia*), containing a dark-green substance, which changes at maturity into minute seeds (*zoospores*; so called from having at one period a motion as if endowed with animal life); attached to the outer threads (*filaments*) of which the frond is composed.

Habitat. South and west coasts of Great Britain chiefly. Devonshire. Scilly. Miltown Malbay, &c.

Some specimens of this plant are much oftener divided and re-branched than others, and form a circle when laid out. For other *Codiums*, see next Plate.

Fig. 286. BRYOPSIS PLUMOSA.

Colour. A fine, deep, glossy green ; stems especially glistening when dried and partly emptied of colouring matter.

Substance. Membranaceous, but firm ; slippery.

Character of Frond. Thread-shaped (*filiform*) ; uninterruptedly tubular throughout ; filled with green colouring matter ; much branched. Stems sometimes undivided, and set with numerous close branches ; sometimes irregularly forked. Branches naked below ; above, closely plumed like a feather, with short, slender, nearly opposite branchlets ; these sometimes re-branchleted with a smaller set (*branchleteens*) ; the lower branchlets longest ; upper, short ; producing a lanceolate outline of branch. The whole at one level, or rarely otherwise.

Measurement. From 1 to 4 inches long.

Fructification. Minute seeds (*zoospores* ; so called from having at one period a motion as if endowed with animal life) ; formed in the colouring matter of the frond.

Habitat. Our coasts generally. On rocks near low-water mark. Not uncommon.

Dr. Harvey describes it as " a plant whose branches resemble beautiful, glossy, bright-green feathers." It is well grown in Filey Bay on a flat ledge of rocks leading to " The Spittals," only uncovered at very low tides. In an Aquarium it sometimes degenerates into a very ugly, *unplumose* variety ; the *B. Lamorouxii* of some authors.

Fig. 287. BRYOPSIS HYPNOIDES.

Colour. A fine yellowish green ; stems especially glistening when dried and partly emptied of colouring matter.

Substance. Membranaceous, but firm ; slippery.

Character of Frond. Thread-shaped (*filiform*) ; uninterruptedly tubular throughout ; filled with green colouring matter ; very much branched. Stems undivided or irregularly forked ; furnished with long, alternate, re-branched or irregularly-divided branches ; the lesser ones set with long, slender branchlets ; more or less crowded with *branchleteens* towards their tips. *Branchleteens* springing from all sides.

Measurement. From 2 to 4 inches long.

Fructification. Minute seeds (*zoospores* ; so called from having at one period a motion as if endowed with animal life) ; formed in the colouring matter of the frond.

Habitat. The warmer stations of our coasts. South of England. West of Ireland, &c. On rocks and the large algæ, especially *Laminaria saccharina*, at extreme low-water mark and beyond. Rare generally.

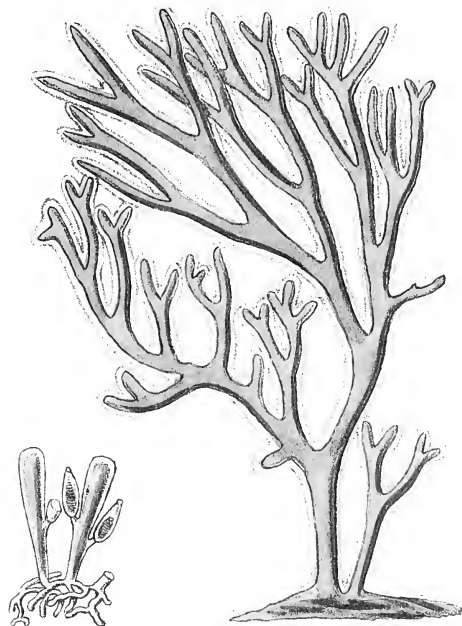
A slenderer, lighter coloured, and more compoundly-branched plant than *B. plumosa* ; but intermediate specimens occur.

284.



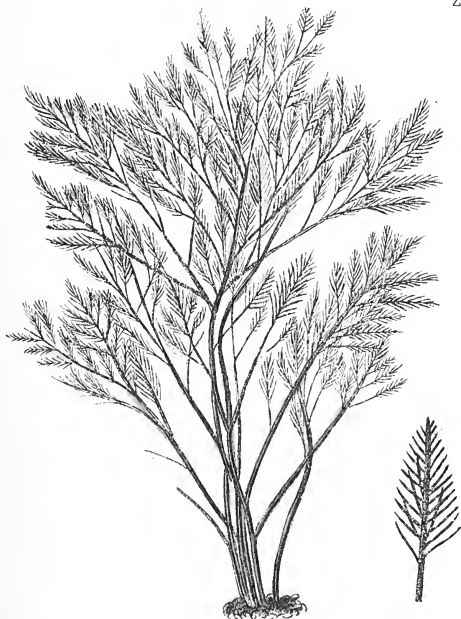
Godium Bursa, Ag.

285.



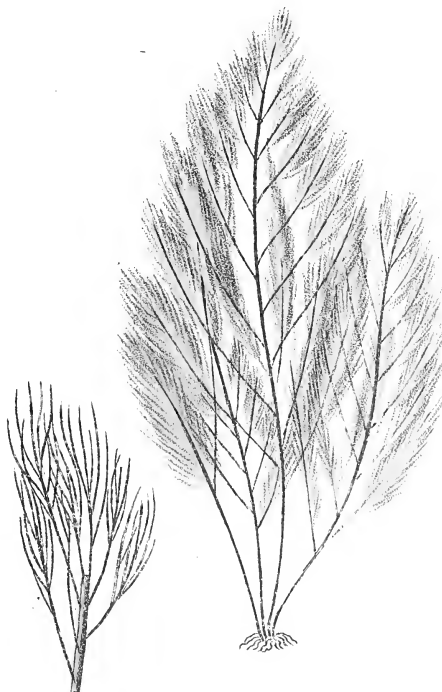
Godium tomentosum, Stack.

286.



Bryopsis plumosa, Ag.

287.



Bryopsis hypnoides, Lamour.



PLATE LXII.

Fig. 288. CODIUM ADHÆRENS.

Colour. Dark green.

Substance. Gelatinous ; densely spongy.

Character of Frond. A velvety crust, spreading over the surface of rocks in irregular patches.

Measurement. Patches, 2 or more feet in extent.

Fructification. Not observed, but no doubt the same as in other species of *Codium* (refer under Figs. 284 and 285).

Habitat. Torquay. Land's End. Gorran Haven. Falmouth. Co. Antrim, &c. On rocks near low-water mark. Very rare.

Fig. 289. CODIUM AMPHIBIUM.

Colour. A grassy green.

Substance. Soft ; densely spongy.

Character of Frond. Minute ; upright ; cylindrical ; round-topped ; rising in great numbers from a spreading base of entangled threads (*filaments*) ; usually simple ; rarely branched.

Measurement. From $\frac{1}{4}$ of an inch to 1 inch high ; the patches spreading indefinitely.

Fructification. Not observed, but no doubt the same as in other species of *Codium* (refer under Figs. 284 and 285).

Habitat. Roundstone, and at the head of Birtirbui Bay, Galway. On turf-banks at high-water mark ; washed over by the tides, but exposed to rain and air at other times.

Fig. 290. VAUCHERIA MARINA.

Colour. Bright green ; becoming rather brownish when old ; somewhat glossy when dry.

Substance. Exceedingly soft and limp.

Character of Frond. Fine tufts of hair-like threads (*filaments*). Filaments not jointed ; tubular throughout ; filled with green colouring matter (*endochrome*), which often runs partially out ; irregularly branched ; occasionally forked. Branches few, long, upright, blunt.

Measurement. From 1 to 3 inches long.

Fructification. Small, stalked, pear-shaped sacs (*sporangia*), containing a dark-green mass, which changes at maturity into minute seeds (*zoospores* ; so called from having at one period a motion as if endowed with animal life) ; borne on the branches.

Habitat. Torbay. Salcombe. Appin, &c. On algæ and mud between tide-marks.

This little plant grows profusely, even to a troublesome extent, in aquariums, fruiting regularly in the summer.

Fig. 291. VAUCHERIA SUBMARINA.

Colour. A bright green.

Substance. Exceedingly soft and limp.

Character of Frond. Fine tufts of hair-like threads (*filaments*). Filaments not jointed; tubular throughout; filled with green colouring matter, which often runs partially out; repeatedly forked (*dichotomous*).

Measurement. Two or 3 inches long.

Fructification. Small, egg-shaped, or lanceolate sacs (*sporangia*), containing a dark-green mass, which changes at maturity into minute seeds (*zoospores*; so called from having at one period a motion as if endowed with animal life).

Habitat. Weymouth. On the muddy sea-shore. Rare.

Fig. 292. VAUCHERIA VELUTINA.

Colour. A deeper green than the preceding.

Substance. Densely spongy.

Character of Frond. A mass of tough threads (*filaments*); forming a velvety carpeting on mud. Filaments creeping; not jointed; tubular throughout; filled with green colouring matter (*endochrome*), which often runs partially out; sending up short, upright, simple or forked branchlets, cut to one height, like the pile of clipped velvet.

Measurement. The mass of green coating indefinite. Branchlets $\frac{1}{6}$ of an inch high.

Fructification. Small, stalked, globose sacs (*sporangia*), containing a dark-green mass, which, at maturity, is transformed into minute seeds (*zoospores*; so called from having at one period a motion as if endowed with animal life).

Habitat. Appin. Miltown Malbay. And on most muddy sea-shores.

Fig. 293. CLADOPHORA BROWNII.

Colour. Black-green when growing, but when the water is pressed out, and the plant held to the light, a beautiful yellow-green.

Substance. Very rigid; spongy.

Character of Frond. Exceedingly dense, cushion-like tufts of jointed threads (*filaments*) rising from a mass of creeping fibres. Filaments elastic; upright; furnished with a few long, nearly simple, secund branches; so matted together that it is difficult to separate a single thread.

Joints. Four or five times longer than broad; the lower ones thickened upwards.

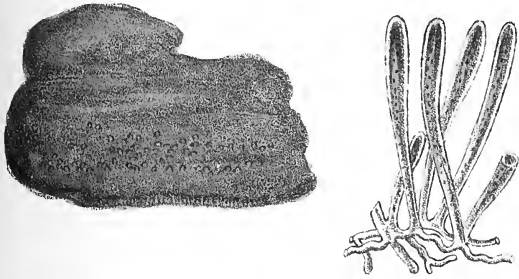
Measurement. From $\frac{1}{2}$ an inch to 1 inch high.

Fructification. Minute seeds (*zoospores*; so called from having at one period a motion as if endowed with animal life); formed of the colouring matter in the joints; and in due time bursting through them.

Habitat. Cornwall. North of Ireland. Wicklow. On rocks exposed to the dripping of fresh water, and the occasional overflow of the sea.

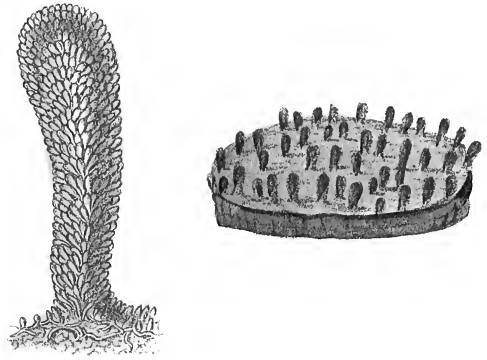
A plant belonging as much to the land as the sea.

288.



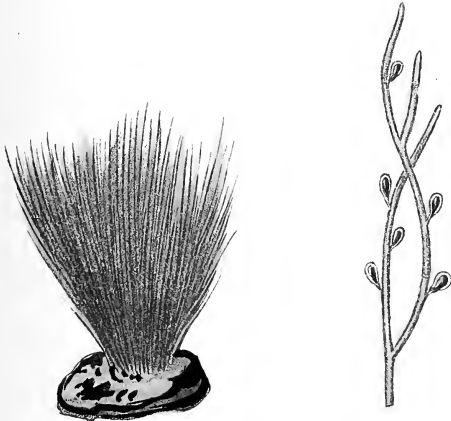
Codium adherens, Ag.

289.



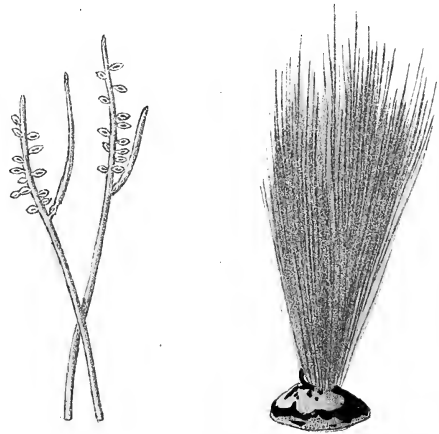
Codium amphibium, Moore.

290.



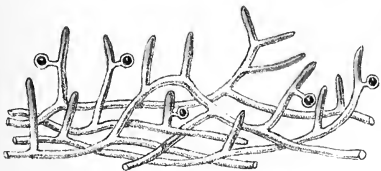
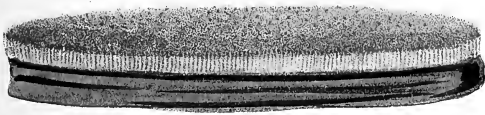
Vaucheria marina, Lyngb.

291.



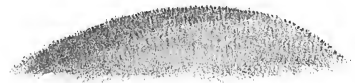
Vaucheria sudmarina, Berk.

292.



Vaucheria velutina, Ag.

293.



Cladophora Brownei, Harv.

PLATE LXIII.

Fig. 294. CLADOPHORA PELLUCIDA.

Colour. A fine, glossy, transparent green ; fading in the herbarium.

Substance. Rigid ; wiry ; adhering very imperfectly to paper.

Character of Frond. Thread-like (*filamentous*) ; jointed ; solitary or slightly tufted ; distantly, much branched. Stems as thick as a hog's bristle ; undivided at first ; then forked (*dichotomous*), or three- (or even four-) armed (*trichotomous*) ; and, more or less, regularly continuing this character throughout. Upper branches furnished with branchlets of the same three-armed growth ; or occasionally tufted. Branches re-branchleted.

Joints. From three-quarters of an inch to an inch long below ; shorter upwards ; branches springing from all the partition-lines (*dissepiments*) ; filled with green colouring matter (*endochrome*).

Measurement. From 4 to 6 inches long.

Fructification. Minute seeds (*zoospores** ; so called from having at one period a motion as if endowed with animal life) ; formed of the colouring matter in the joints ; and in due time bursting through them.

Habitat. Our coasts generally. In deep rock-pools near low-water mark. Not very common.

* This explanation of the word *zoospores* need not, surely, be continued longer. *C. pellucida* is, from its extremely long joints and three-armed branching, a quite clearly marked British species.

Fig. 295. CLADOPHORA RECTANGULARIS.

Colour. A full green ; fading in the herbarium.

Substance. Rigid ; bristling ; adhering very imperfectly to paper.

Character of Frond. Thread-like (*filamentous*) ; jointed ; several growing near together and entangled in intricate bundles ; distantly, much branched. Filaments as thick as hogs' bristles throughout ; set with long, wavy, wide-spread, exactly opposite branches ; or, occasionally, irregularly divided. Branches rebranched in the same way ; more or less furnished with very short, exactly opposite, horizontal branches, which are sometimes simple ; sometimes re-branchleted with a second similar set.

Joints. Twice or thrice as long as broad throughout ; filled with green colouring matter (*endochrome*).

Measurement. From 8 to 12 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints ; and in due time bursting through them.

Habitat. Abundant in Roundstone Bay. Arran. Torquay. Thrown ashore. Very rare generally.

Another most clearly marked species ; but, unluckily, extremely rare. The tiny, exactly opposite branchlets, are found on no other British *Cladophora*.

Fig. 296. CLADOPHORA MACALLANA.

Colour. A rich grass-green ; fading in the herbarium.

Substance. Rigid ; bristling ; adhering very imperfectly to paper.

Character of Frond. Thread-like (*filamentous*) ; jointed ; several growing near together and entangled in intricate bundles ; excessively branched. Filaments as thick as hogs' bristles throughout ; irregularly set with long, very wavy, alternate or rarely opposite branches. Branches re-branched in the same way ; more or less clothed with short, back-curved, very wide-spread branchlets, which are either simple, or set on one side like a comb (*pectinated*) with a second set. Tips obtuse.

Joints. Twice or thrice as long as broad throughout ; filled with rather dense-green colouring matter (*endochrome*).

Measurement. From 6 to 20 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints ; and in due time bursting through them.

Habitat. West of Ireland. Roundstone Bay, &c. On the sandy bottom of the sea, in from four to ten fathoms' water. Obtained by dredging, or thrown ashore.

Like *C. rectangularis* in general appearance ; from which, however, its *pectinated*, instead of *opposite* branchlets completely distinguish it.

Fig. 297. CLADOPHORA HUTCHINSIÆ.

Colour. Bluish green, with changeable tints when fresh ; fading in the herbarium.

Substance. Rigid ; crisp ; bristling ; but more or less adhering to paper.

Character of Frond. Loose tufts of jointed threads (*filaments*) very much branched. Filaments as thick as hogs' bristles throughout ; wavy ; several times irregularly divided and branched. Branches distant ; spreading ; more or less furnished with short, slightly curved branchlets having a few *secund*, one-jointed branchlets along their inner face. Tips very obtuse.

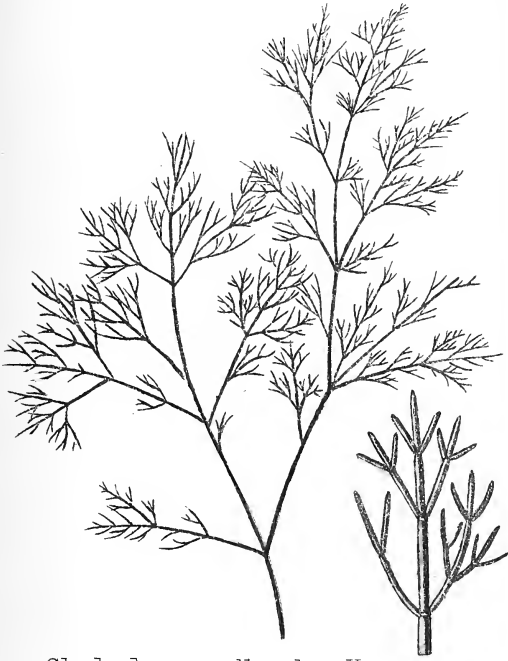
Joints. About twice as long as broad throughout ; the partition-lines (*dissepiments*) contracted ; filled with green colouring matter (*endochrome*).

Measurement. From 6 to 8 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, and in due time bursting through them.

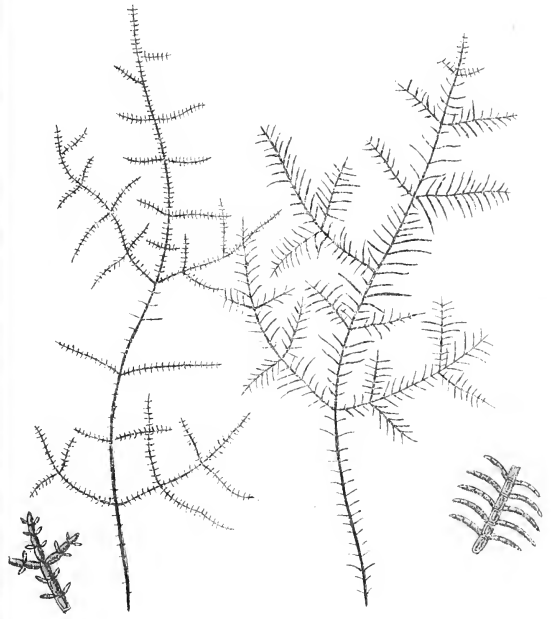
Habitat. Bantry Bay. Isle of Man, and a few stations on our coasts.

294.



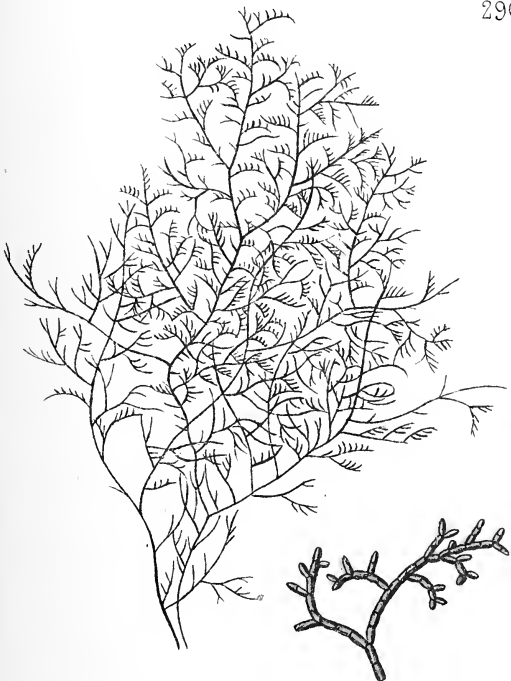
Cladophora pellucida, Kütz.

295.



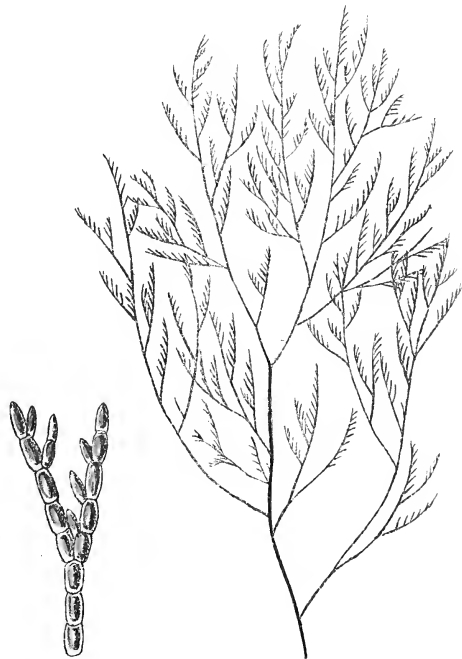
Cladophora rectangularis, Griff.

296.



Cladophora Macallana, Harv.

297.



Cladophora Hutchinsiae, Harv.

PLATE LXIV.

Fig. 298. CLADOPHORA DIFFUSA.

Colour. A dark or full green.

Substance. Generally, rigid and bristling when fresh ; occasionally soft. Imperfectly adhering to paper.

Character of Frond. Loose tufts of jointed threads (*filaments*) ; much branched. Filaments as thick as horse-hair ; very waving ; distantly set with long, irregularly sub-divided, occasionally forked branches. Branches furnished towards the top with a few *secund*, simple branchlets.

Joints. Three or four times longer than broad ; nearly uniform throughout ; filled with dark-green colouring matter (*endochrome*) ; the partition-lines (*dissepiments*) contracted.

Measurement. From 6 to 10 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints ; and in due time bursting through them.

Habitat. Our shores generally. On rocks and stones between tide-marks. Not uncommon.

So closely allied to the preceding that it is sometimes impossible to pronounce to which species a specimen should be referred. But those with thicker filaments, more numerous branchlets, and obtuse tips, may be considered as *C. Hutchinsiae*.

Fig. 299. CLADOPHORA RUPESTRIS.

Colour. A rich dark green ; finest in the deepest water ; fading, after a time, in the herbarium.

Substance. Rigid ; imperfectly adhering to paper.

Character of Frond. Thick tufts of jointed threads (*filaments*) very much branched. Filaments slender, straight, bushy ; set with very upright, rod-like, crowded branches, sometimes re-branched. Branches densely clothed with equally upright, opposite or tufted, rod-like branchlets, which are again re-branchleted ; tips pointed. Angles of branching (*axils*) so narrow that the branches lie almost close against the stems whence they spring.

Joints. Three or four times longer than broad ; filled with dark-green colouring matter (*endochrome*) ; in drying, the alternate ones often shrink considerably.

Measurement. From 3 to 6 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints ; and in due time bursting through them.

Habitat. Our shores generally. On rocks between tide-marks, and beyond. Very common.

This is another *Cladophora* with decided characters. No one can well mistake it for another species, if the commonest attention be paid to the descriptions given of its growth.

Fig. 300. CLADOPHORA LÆTEVIRENS.

Colour. A pale transparent yellow-green ; greyish and without gloss when dry.

Substance. Soft ; more or less adhering to paper.

Character of Frond. Dense tufts of jointed threads (*filaments*), very much branched ; bushy. Filaments scarcely as thick as horse-hair ; closely set with numerous, straight, but spreading, opposite, or irregularly-set branches, which are repeatedly re-branched. Branches often crowded with re-branched branchlets ; the last set of which are *secund* and spreading ; tips blunt.

Joints. Those of the principal branches long ; of the branchlets about twice as long as broad ; filled with light-green colouring matter (*endochrome*).

Measurement. From 4 to 8 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints ; and in due time bursting through them.

Habitat. Our coasts generally. On rocks, &c. in tide-pools. Very common.

In habit of growth very like *C. glomerata*, which is common in fresh-water streams, and sometimes grows to a greater length than the marine plant. They are supposed by botanists to be the same species under different circumstances of existence.

Fig. 301. CLADOPHORA FLEXUOSA.

Colour. A rather dull green ; often half-opaque.

Substance. Somewhat rigid and harsh to the touch, but more or less adhering to paper.

Character of Frond. Loose tufts of jointed threads (*filaments*), very much branched. Filaments very wavy, or angularly bent ; clothed more or less closely throughout, with wavy branches of very unequal lengths, alternately or irregularly set. Branches several times divided and re-branched ; the last divisions long, spreading, curved, set with delicately slender branchlets, arranged *secund*-wise, like the teeth of a comb, first on one side, then on the other, of the stems ; their tips very fine.

Joints. Those of the branches three or four times as long as broad ; those of the branchlets twice ; filled with green colouring matter (*endochrome*).

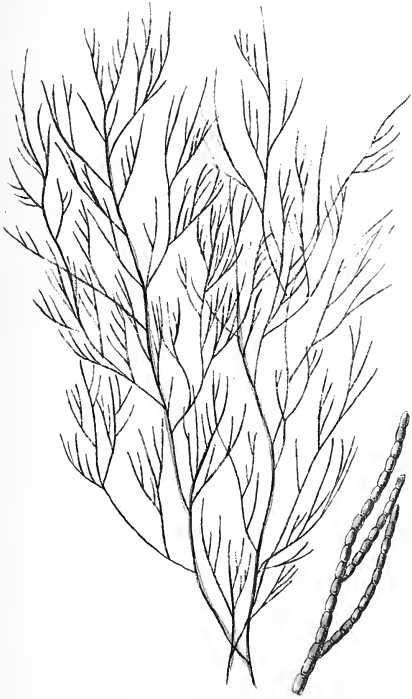
Measurement. From 4 to 8 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, and in due time bursting through them.

Habitat. Yarmouth. Torquay. Ballycastle. Clontarf, &c. In rock-pools between tide-marks, and in salt-water ditches near Yarmouth. Not uncommon.

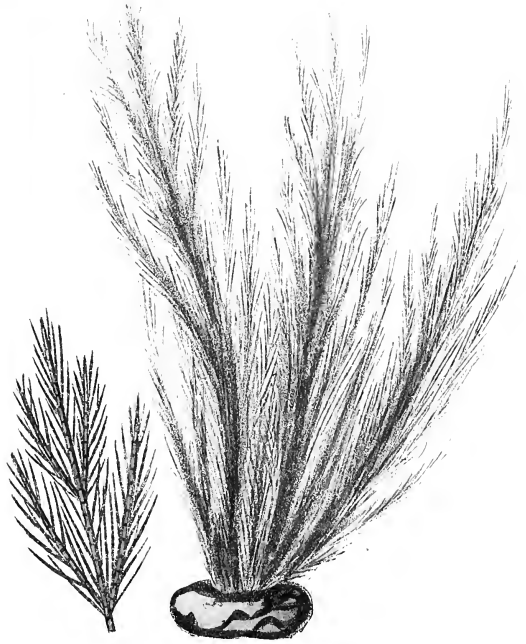
In specimens from Clontarf the extreme slenderness of the *secund* branchlets forms quite a mark of distinction.

298.



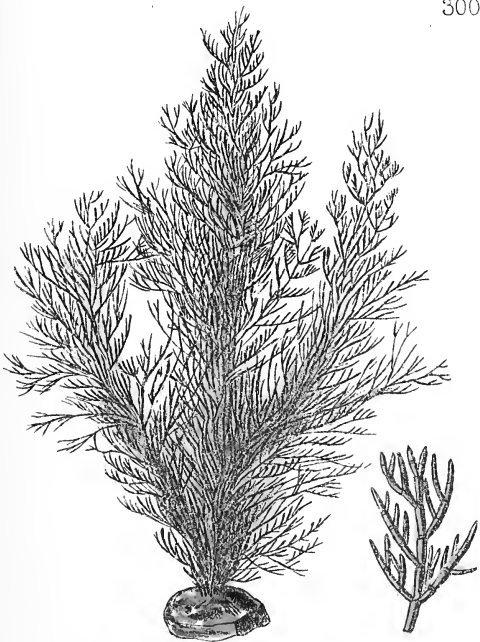
Cladophora diffusa, Harv.

299.



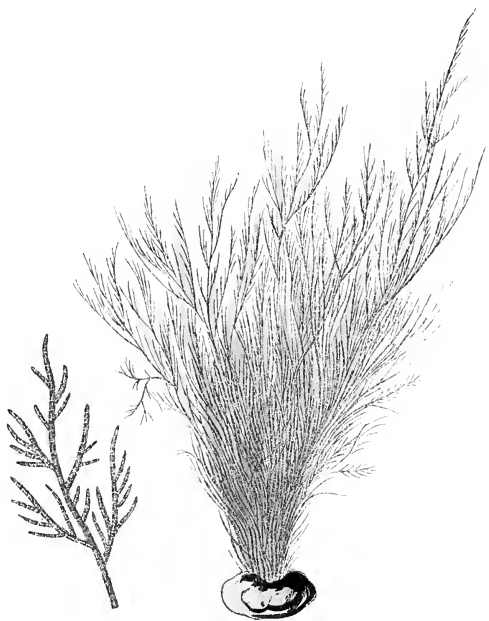
Cladophora rupestris, Kütz.

300.



Cladophora laetevirens, Kütz.

301.



Cladophora flexuosa, Griff.

PLATE LXV.

Fig. 302. CLADOPHORA GRACILIS.

Colour. Bright yellow-green.

Substance. Soft; silky; but adhering imperfectly to paper; fading in the herbarium, but retaining its gloss.

Character of Frond. Dense tufts of jointed threads (*filaments*), very much branched. Filaments long, slender; the main ones entangled together, into something of a general stem, from which spring very numerous, long, wavy, angularly-twisted branches, plentifully clothed with branchlets; which are much divided and branched; almost tufted; the last set long, slender, *secund*, in rows like the teeth of a comb.

Joints. From three to five times longer than broad, filled with light-green colouring matter (*endochrome*).

Measurement. From 6 to 12 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, and in due time bursting through them.

Habitat. Our shores generally. On *Zostera* and the larger algæ in from four to six fathoms' water. Not uncommon.

More luxuriant, more glossy, and more branching than *C. flexuosa*. Less silky, less slender, and less soft than *C. Rudolphiana*.

Fig. 303. CLADOPHORA BALLIANA.

Colour. Grass-green.

Substance. Soft and tender; almost gelatinous, closely adhering to paper.

Character of Frond. Fine tufts of jointed threads (*filaments*), very much branched. Filaments extremely slender; set with long, upright, irregularly alternate branches. Branches excessively divided; the last set upright, rod-like; clothed with remarkably slender, *secund*, one- or two-jointed branchlets. Tips pointed.

Joints. Those of the branches eight or ten times longer than broad; of the branchlets six or eight times; filled with remarkably dense green colouring matter (*endochrome*). Partition-lines (*dissepiments*) broad and transparent.

Measurement. From 6 to 8 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, and in due time bursting through them.

Habitat. Clontarf. Miss Ball.

From the enormous length of the joints like no other British *Cladophora* but *C. Rudolphiana*, from which a quite different character of branching separates it.

Fig. 304. CLADOPHORA RUDOLPHIANA.

Colour. Bright yellow-green.

Substance. Extremely soft and silky; almost gelatinous; adhering closely to paper.

Character of Frond. Long tufts of jointed threads (*filaments*), very much branched. Filaments exceedingly slender, inextricably entangled. Branches three-forked (*trichotomous*) or irregular; repeatedly branched; plentifully clothed with branchlets which are much divided and branched, almost tufted; the last set very long and finely drawn out; *secund*, or partly alternate. Tips very fine.

Joints. Those of the main filaments many times as long as broad, here and there swollen. Of the branchlets from six to ten times. The colouring matter in them apt to take a spiral form.

Measurement. From 6 to 20 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, and in due time bursting through them.

Habitat. A few stations on our coasts. In Roundstone Bay plentiful. Connemara. Falmouth. On algæ and *Zostera* in from two to six fathoms' water. Very local, therefore rare.

Resembling *C. gracilis* in the great length of the branchlets, but much slenderer and softer. In general appearance and the length of the joints like *C. Balliana*, but much more profusely branched, and differently. Not unlike *C. albida* either; but from this the great length of the joints keeps it as clear as one *Cladophora* can be kept from another. But this is a *genus* abounding in intermediate forms, and, at present, in doubtful distinctions! Perhaps *le bon temps viendra* when these difficulties will be cleared up.

Fig. 305. CLADOPHORA REFRACTA.

Colour. Bright green, sometimes yellowish.

Substance. Rather rigid; bristling; imperfectly adhering to paper.

Character of Frond. Tufts of jointed threads (*filaments*), very much branched. Filaments long; slender; the stems somewhat woven together and ropy. Secondary branches free; spreading on all sides and much divided; densely clothed with short, spreading or back-curved, opposite or alternate branchlets; which are furnished on the inside with a second set arranged like the teeth of a comb (*pectinated*).

Joints. Twice or thrice as long as broad throughout.

Measurement. Three or 4 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, and in due time bursting through them.

Habitat. Our coasts generally. In rocky pools left by the tide. Not uncommon.

Nearly allied to *C. albida*, but with coarser and far more rigid filaments; also its last branchlets shorter and more wide-spread (often strongly bent back); and the whole plant by no means spongy.

302.



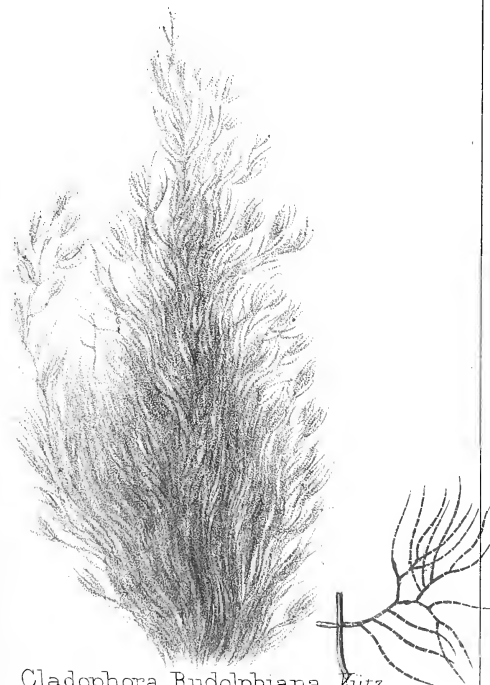
Cladophora gracilis, Griff.

303.



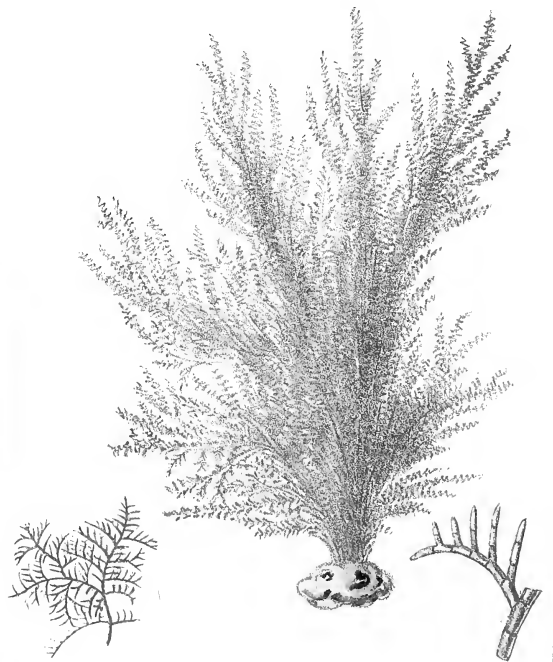
Cladophora Balliana, Harv.

304.



Cladophora Rudolphiana, Kütz.

305.



Cladophora refracta, Kütz.



PLATE LXVI.

Fig. 306. CLADOPHORA REPENS.

Colour. Dark green.

Substance. Rigid; spongy.

Character of Frond. Short, dense, cushion-shaped, or globular tufts of jointed threads (*filaments*). Filaments slender; closely matted together; rising from root-like fibres; slightly branched. Branches simple or forked; upright or oddly bent; bare, or clothed with a few distant, *secund* branchlets.

Joints. From ten to twenty times their width; cylindrical throughout; *i. e.* not swollen upwards like those of *C. Brownii*; filled with green colouring matter (*endochrome*).

Measurement. Tufts an inch or 2 in diameter. Filaments scarcely $\frac{1}{2}$ an inch high.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, and in due time bursting through them.

Habitat. Jersey. Once picked up there after a gale.

Fig. 307. CLADOPHORA NUDA.

Colour. Dark green; or olive when dry.

Substance. Somewhat rigid.

Character of Frond. Loose tufts of jointed threads (*filaments*), sparingly branched. Filaments slender; very straight; here and there forked (*dichotomous*). Branches set with a few scattered, very upright, rod-like, close-lying branchlets; the angles of branching (*axils*) being very narrow. Uppermost branchlets often opposite and long, so that the tips of the branches appear three-forked (not expressed in the plate).

Joints. Six or eight times longer than broad; filled with green colouring matter (*endochrome*).

Measurement. Two or 3 inches high.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, and in due time bursting through them.

Habitat. Portstewart. On basalt rocks in the sea. Unknown elsewhere, and only once seen there.

Fig. 308. CLADOPHORA LANOSA.

Colour. Yellow-green; fading pale, and quite without gloss when dry.

Substance. Soft; spongy.

Character of Frond. Short, dense, globular tufts of jointed threads (*filaments*); sparingly branched, forming a circle when laid out. Filaments hair-like; woolly; matted together; throwing out fibres from the lower joints. Branches straight, rod-like, alternate or rarely opposite; set with a few alternate or *secund* branchlets. Angles of branching (*axils*) very narrow.

Joints. The lower ones twice, the upper six times as long as broad; filled with pale green colouring matter (*endochrome*).

Measurement. An inch high.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, and in due time bursting through them.

Habitat. Our coasts generally, but prefers the north. Parasitic on various algæ; often on *Polyides rotundus*; occasionally on rocks. Common.

Fig. 309. CLADOPHORA UNCIALIS.

Colour. Yellowish-green; but more grassy than the preceding, and not fading so pale when dry; the tips occasionally bright.

Substance. Soft and spongy.

Character of Frond. Short, dense tufts of jointed threads (*filaments*), sparingly branched. Filaments hair-like; woolly; wavy; the older ones inextricably matted together, but in several thick subdivisions throwing out fibres. Branches irregular; set with a few distant, *secund*, long, spreading or incurved branchlets.

Joints. From two to four times longer than broad; filled with green colouring matter (*endochrome*).

Measurement. An inch high.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, and in due time bursting through them.

Habitat. Our shores generally. On rocks near low-water mark. Common.

Fig. 310. CLADOPHORA ARCTA.

Colour. A brilliant, glossy, grass-green when young; olive and dull when old; at "a certain age" olive and dull below; glistening at the tips, which being in fact the youngest shoots of the plant, change last.

Substance. Soft, and retaining water at all times; coarse and very spongy when old.

Character of Frond. Broad, star-like tufts of jointed threads (*filaments*) rising from a wide disc of matted fibres. Filaments as thick as horse-hair; spreading in a circle; much branched. When young, clothed with straight, crowded, very upright, alternate or opposite branches; bearing branchlets of the same character, but often *secund* branchlets. When old, matted into rope-like bundles below, by root-like fibres from the joints; the upper branchlets only free.

Joints. Extremely variable in length; the lower, however, generally only once or twice as long as broad, the upper many times longer; filled with green colouring matter (*endochrome*).

Measurement. From 2 to 4 inches high.

Fructification. As before.

Habitat. Our coasts generally. On rocks from half-tide level to low-water mark. Common.

Fig. 311. CLADOPHORA GLAUDESCENS.

Colour. A bright but scarcely grass-green; varying, however, in different specimens.

Substance. Soft and rather silky; having a speckled, shimmering look when dry, and seen through a pocket lens.

Character of Frond. Dense tufts of jointed threads (*filaments*), excessively branched. Filaments very wavy; hair-like (but not so slender as those of *C. refracta*), furnished with straight, erect, alternate branches, several times re-branched; the lesser ones closely set with very upright, long, finely drawn out, alternate or *secund* branchlets.

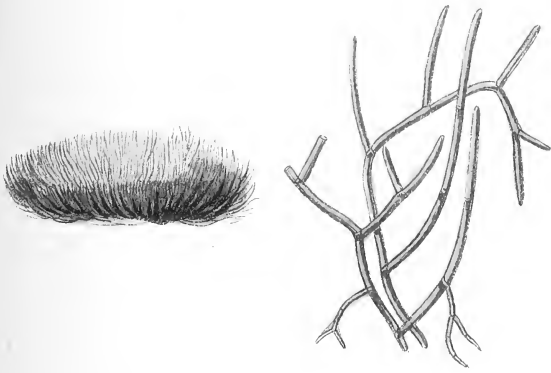
Joints. About three times as long as broad; nearly uniform throughout; filled with green colouring matter (*endochrome*).

Measurement. Two or 3 inches long, generally; but occasionally up to 6.

Fructification. As before.

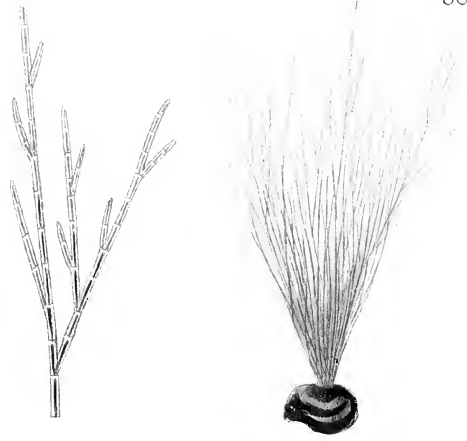
Habitat. Our coasts generally. On rocks and stones between tide-marks. Common.

306.



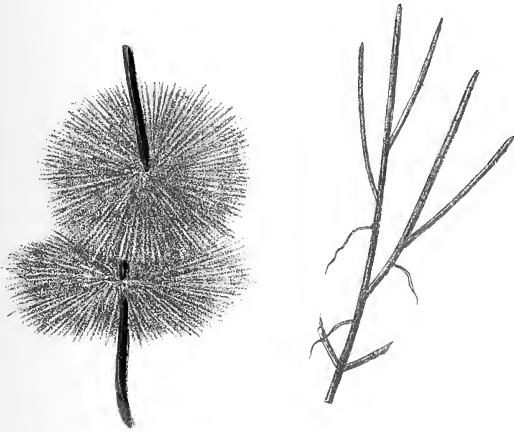
Cladophora repens, J.Ag.

307.



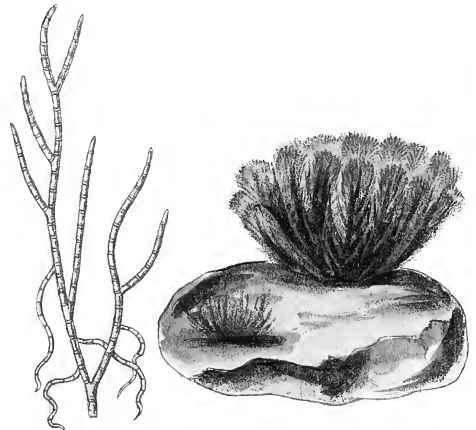
Cladophora ruda, Harv.

308.



Cladophora lanosa, Kütz.

309.



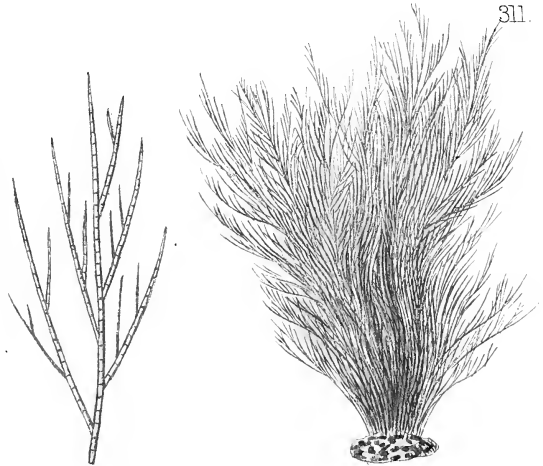
Cladophora uncialis, Harv.

310.



Cladophora arcta, Kütz.

311.



Cladophora glaucescens, Griff.

PLATE LXVII.

Fig. 312. CLADOPHORA MAGDALENÆ.

Colour. A dark, dingy green.

Substance. Somewhat rigid; not adhering to paper in drying.

Character of Frond. Short, hair-like; jointed threads (*filaments*) matted together; entangled among the bases of other algæ. Filaments bent, straggling, almost distorted, irregularly forked; with very wide angles of branching (*axils*). Branches curved; wide-spread; set with a few forked or *secund* branchlets, which are quite as thick as the stems whence they spring.

Joints. Three or four times longer than broad; filled with very dense, dark-green colouring matter (*endochrome*); the partition-lines (*dissepiments*) very narrow; not contracted.

Measurement. One inch long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, and in due time bursting through them.

Habitat. Jersey. One specimen.

Fig. 313. CLADOPHORA GATTYÆ.

Colour. A dull, dirty olive-green.

Substance. Rather rigid; not adhering to paper.

Character of Frond. Short jointed threads (*filaments*) densely matted together in ropy tufts. Filaments coarsely hair-like; irregularly branched; somewhat forked; set with a few simple, wide-spread branchlets. Angles of branching (*axils*) rounded.

Joints. About once and a half as long as broad; very uniform throughout; filled with dull green or olive colouring matter (*endochrome*). Partition-lines (*dissepiments*) very narrow; contracted.

Measurement. One inch long.

Fructification. As before.

Habitat. Uncertain between Hastings and Filey. One specimen.

Fig. 314. CLADOPHORA FLAVESCENS.

Colour. Pale yellow; glossy when dry.

Substance. Soft; silky; not adhering to paper.

Character of Frond. Very slender jointed threads (*filaments*) growing in long, entangled tufts in pools and ditches, where it rises at last to the surface, forming a floating fleece intermixed with large air-bubbles. Filaments sparingly branched in a partly forked, partly alternate manner. Branches long, upright, wide-spread; set with scattered, alternate, or *secund* branchlets.

Joints. Eight or nine times longer than broad; filled with light yellow colouring matter (*endochrome*), never very dense. Partition-lines (*dissepiments*) contracted.

Measurement. Indefinite.

Fructification. As before.

Habitat. In pools and ditches of brackish or fresh water. In a fountain-pond in the Montpellier Gardens, Harrowgate. Not uncommon.

Fig. 315. CLADOPHORA FRACTA.

Colour. A dullish green ; more or less light or dark.

Substance. Rigid ; not adhering to paper.

Character of Frond. Coarse jointed threads (*filaments*) growing in long entangled tufts in pools and ditches, where it rises at last to the surface, forming a floating fleece. Filaments distantly branched ; the lesser branches somewhat forked, and spreading with very wide angles of branching (*axils*). Branchlets few, alternate, or often *secund.*

Joints. Very irregular in length. From three to six times as long as broad ; different lengths intermixed ; filled with dense, full-green colouring matter, which, under the microscope, is evidently formed into little grains (*granules*).

Measurement. Indefinite.

Fructification. As before, except that here and there, when well developed, the *zoospores* fill the joints entirely, so that these become in fact a string of fruit-cells (*sporangia*). This is usually observed about the middle of the frond.

Habitat. In pools and salt-water ditches as well as in inland lakes.

Fig. 316. RHIZOCLONIUM RIPARIUM.

Colour. Light, bright yellow-green (sometimes darker) ; fading very dull in the herbarium.

Substance. Soft and delicately woolly ; a peculiarity it retains in the herbarium.

Character of Frond. Long, slender, jointed threads (*filaments*) lying flat on the sides of rocks, clothing them with a fine close fleece. Filaments entangled ; here and there angularly bent, and sending out from the angles short, horizontal, thorn-like, jointed fibres, which rarely lengthen into true branchlets containing colouring matter (*endochrome*).

Joints. From two to four times longer than broad.

Measurement. From 1 to 3 inches long.

Fructification. As before, in the genus *Cladophora*.

Habitat. Our coasts generally. (Filey.) On broad faces of sandy rocks near high-water mark. Not uncommon.

Fig. 317. CONFERVA ARENICOLA.

Colour. Pale yellow-green.

Substance. Soft ; delicate.

Character of Frond. Extremely fine, jointed threads (*filaments*) matted together ; creeping ; forming a thin fleecy web on the ground. Filaments as slender as human hair throughout ; crisped ; wavy ; unbranched.

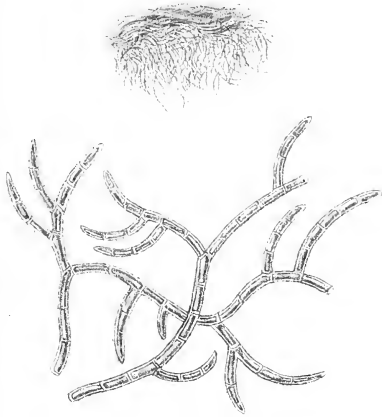
Joints. Once and a half as long as broad, when old enough to be observed ; filled with green colouring matter (*endochrome*), which at last contracts into a dark mass in the centre, leaving the rest of the cell pellucid. When young, the threads appear a uniform colour throughout, varied only by a few scattered dots.

Measurement. Indefinite.

Fructification. As before in the genus *Cladophora*.

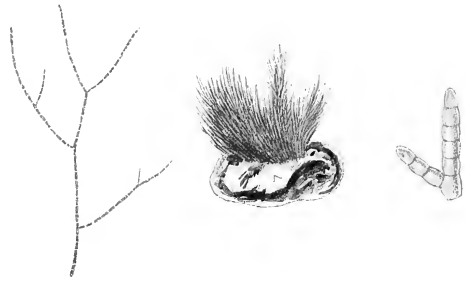
Habitat. "On the sandy margins of pools in a salt-marsh periodically flooded." Rev. M. J. Berkeley.

312.



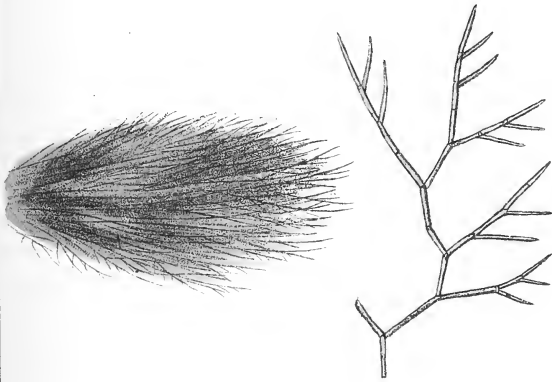
Cladophora Magdalense, Harv.

313.



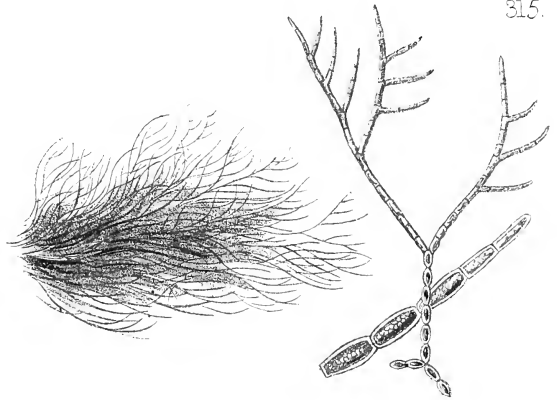
Cladophora Gattysæ, Harv.

314.



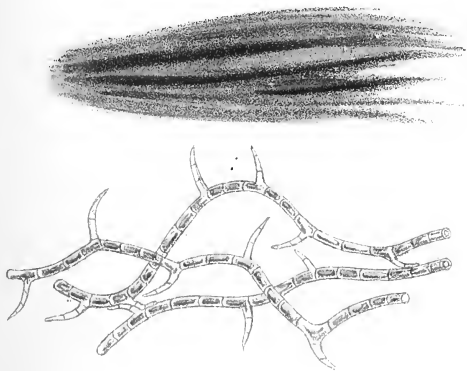
Cladophora flavescens, Kütz.

315.



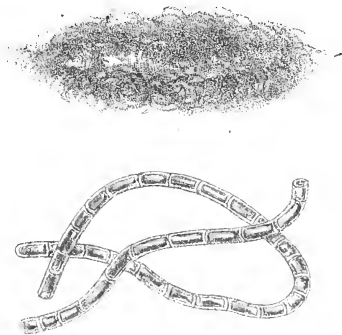
Cladophora fracta, Kütz.

316.



Rhizoclonium riparium, Kütz.

317.



Conferva arenicola, Berk.



PLATE LXVIII.

Fig. 318. RHIZOCLONIUM CASPARYI.

Colour. Light, bright yellow-green; fading very dull in the herbarium.

Substance. Soft and delicately woolly; a peculiarity it retains in the herbarium.

Character of Frond. Long, very slender, jointed threads (*filaments*) lying flat on the sides of rocks, clothing them with a fine close fleece. Filaments entangled, curved, here and there angularly bent; and sending out from the angles short, horizontal, thorn-like, jointed, colourless fibres, which sometimes lengthen into true branchlets, containing colouring matter (*endochrome*).

Joints. From two to six times longer than broad.

Measurement. From 1 to 3 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, and in due time bursting through them.

Habitat. Falmouth and Penzance.

It will be seen, by comparing the descriptions, that except in the greater slenderness of the threads, and occasionally greater length of the joints, there is no difference between this plant and *R. riparium*. And Dr. Harvey says that joints of different lengths are sometimes found even on the same threads.

Fig. 319. CONFERVA TORTUOSA.

Colour. Pale, full, or dark green, in different specimens.

Substance. Rigid.

Character of Frond. Slender, closely-interwoven, jointed threads (*filaments*); forming a fleecy web upon rocks or algæ. Filaments about the thickness of horse-hair; very much and stiffly curled and twisted; unbranched.

Joints. Twice or thrice longer than broad; filled with green colouring matter (*endochrome*).

Measurement. The fleecy web from an inch to several feet in diameter.

Fructification. As before in *Rhizoclonium* (and *Cladophora*). See under Fig. 318.

Habitat. Our shores generally. On rocks and algæ at half-tide level. Very common.

Fig. 320. CONFERVA IMPLEXA.

Colour. Bright green.

Substance. Soft and delicate.

Character of Frond. Very slender, densely-interwoven, jointed threads; forming a fleecy web upon rocks; or little tufts among the branches of other algæ. Filaments as fine as human hair (half the thickness of *C. tortuosa*); entangled, but not stiffly twisted; unbranched.

Joints. About as long as broad; or a trifle longer.

Measurement. Indefinite, from half an inch to a foot.

Fructification. As before.

Habitat. Our coasts generally. On rocks and algæ between tide-marks. Not uncommon.

Fig. 321. CONFERVA ARENOSA.

Colour. Pale green.

Substance. Rigid and harsh for such very slender threads.

Character of Frond. Very slender, interwoven jointed threads (*filaments*), spreading in long, thin, fleecy webs, several of which lie, one on the top of another, like folds of gauze, and can be easily separated. Filaments finer than human hair, when young; when old, exceedingly rough, and apt to be swollen and lumpy (*tubercular*) here and there.

Joints. From three to five times longer than broad; filled with green colouring matter (*endochrome*), which, when old, contracts into a variety of odd shapes.

Measurement. The fleecy webs a yard or more in extent. Filaments 5 or 6 inches long.

Fructification. As before.

Habitat. Appin. Bantry Bay. On the flat sandy shore, about half-tide level.

Fig. 322. CONFERVA LITTOREA.

Colour. Dull green.

Substance. Rigid and brittle.

Character of Frond. Coarse, loosely-interwoven, jointed threads (*filaments*) forming extensive bundles in salt-water ditches and on muddy sea-shores. Filaments as thick as hogs' bristles; variously curved; unbranched.

Joints. Once and a half as long as broad; here and there swollen in pairs and discoloured (see Figure); filled with dense green colouring matter (*endochrome*); the minute grains (*granules*) which compose it visible under a moderate magnifying power.

Measurement. Indefinite.

Fructification. As before.

Habitat. Salt-water ditches, estuaries, and muddy sea-shores; between tide-marks. Not uncommon.

Fig. 323. CONFERVA LINUM.

Colour. Light or deep glossy green, according to age. When very old, very dingy and dull.

Substance. Very rigid and brittle when fresh; soon becoming flabby in the air.

Character of Frond. Long, very coarse, loosely-entangled jointed threads (*filaments*) spreading in fleecy masses in salt-water ditches. Filaments *twice* as thick as hogs' bristles (!); very harsh; very much curled; unbranched.

Joints. As long as broad; or narrower; filled with green colouring matter (*endochrome*), which often takes a rounded form (see figure of a magnified bit).

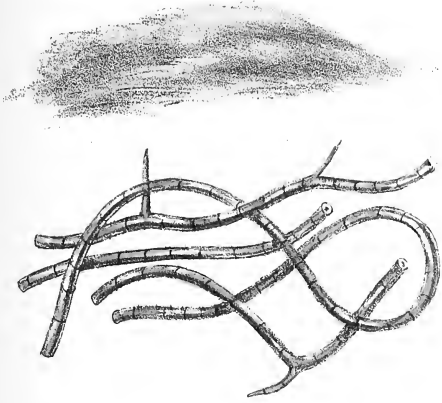
Measurement. Filaments many feet long. The fleecy mass spreading indefinitely.

Fructification. As before.

Habitat. Salt-water ditches near the coast. Very abundant in those by the north wall, Dublin.

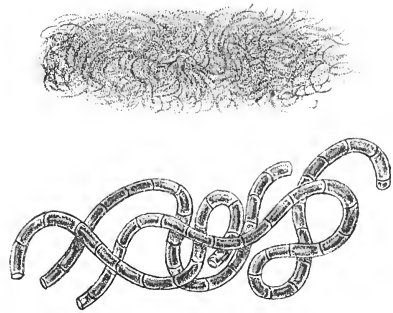
Often called by Agardh's name, *C. crassa*. Dr. Harvey includes several supposed separate species under the name *C. linum*. For other *Confervas*, see Plate LXX.

318.



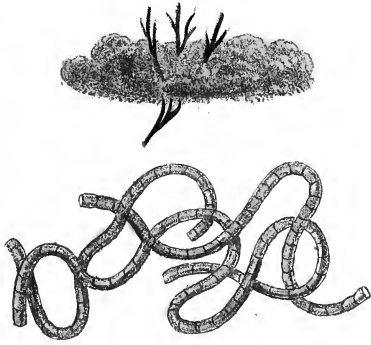
Rhizoclonium Casparyi, Harv.

319.



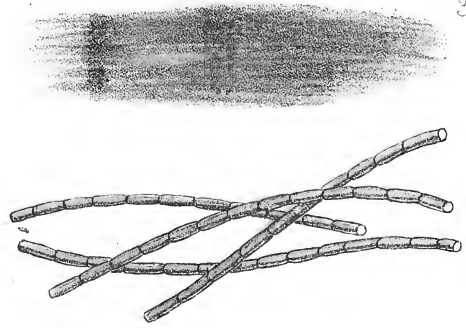
Conferva toruosa, Dillw.

320.



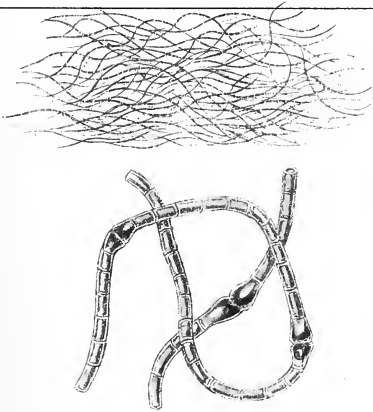
Conferva implexa, Dillw.

321.



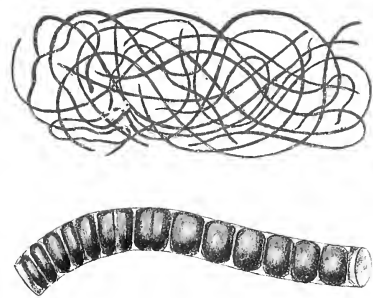
Conferva arenosa, Carn.

322.



Conferva litorea, Harv.

323.



Conferva limum, Roth.



PLATE LXIX.

Fig. 324. CLADOPHORA ALBIDA.

Colour. Pale, or sometimes bright light green; whitish, and generally without gloss, when dry.

Substance. Soft, silky, and very spongy; retaining water and swelling with it; soft to the touch when dry.

Character of Frond. Fine tufts of jointed threads (*filaments*) excessively branched. Filaments slenderer than human hair; crowded with long irregular branches, spreading on all sides, and several times re-branched; the upper branches straight; spreading; often opposite. These set with straight, upright, short, opposite, or *secund* branchlets; one issuing from each joint, and occasionally bearing a second set.

Joints. Four or five times longer than broad; filled with light green colouring matter (*endochrome*).

Measurement. From 2 to 6 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, and in due time bursting through them.

Habitat. Southern shores of England and Ireland. On rocks and algæ between tide-marks, usually near low-water mark. Not uncommon.

This *Cladophora* approaches nearest to *C. refracta* in appearance; but it is a much taller plant when well grown. Moreover, it is distinctly *spongy*, which *C. refracta* is not; and it has a peculiarly soft woolly feeling when dry, which distinguishes it from all the genus but *C. lanosa*.

Fig. 325. CLADOPHORA FALCATA.

Colour. A peculiarly rich, glossy green.

Substance. Rigid; but adhering to paper in drying.

Character of Frond. Dense tufts of jointed threads (*filaments*), very much branched. Filaments thicker than human hair; nearly uniform throughout; entangled at the base; irregularly divided; much curved. Branches zigzag; curved and twisted all ways; repeatedly forked. The last divisions crowded; three or four springing together from a stem. These all strongly arched in one direction, like a set of curled feathers; their inner faces clothed with branchlets; some short and blunt; some longer and re-branched.

Joints. Three or four times longer than broad; filled with dense green colouring matter (*endochrome*).

Measurement. Three or 4 inches long.

Fructification. As before.

Habitat. Dingle Harbour, Kerry. Jersey. On the bottoms of clear rock-pools near low-water mark. Not common.

Fig. 326.a CONFERVA ÆREA.

- Colour.* A beautiful yellow-green ; fading in the herbarium to a dirty white.
- Substance.* Harsh and brittle ; but unable to support itself when removed from the water.
- Character of Frond.* Long, upright, unbranched, jointed threads (*filaments*), as thick as hogs' bristles ; growing in tufts from a disc-like root.
- Joints.* About as long as broad, generally ; occasionally longer ; visible to the naked eye ; filled with green colouring matter (*endochrome*), which in drying runs close up to the partitions (*dissepiments*) leaving the middle empty.
- Measurement.* From 3 to 12 inches long.
- Fructification.* As before in *Cladophora*.
- Habitat.* Our coasts generally. On sand-covered rocks between tide-marks. Frequent.
- Resembling *C. Melagonium*, but more tufted ; softer ; and not nearly so stiff.
-

Fig. 326.b CONFERVA MELAGONIUM.

- Colour.* Dark green.
- Substance.* Stiff ; wiry ; rigid.
- Character of Frond.* Long, upright, unbranched, jointed threads (*filaments*), thicker than hogs' bristles ; a few (sometimes but one) growing together from a disc-like root.
- Joints.* Twice as long as broad, filled with dark green colouring matter (*endochrome*). Partition-lines (*dissepiments*) somewhat contracted ; very narrow.
- Measurement.* From 5 to 8 inches high.
- Fructification.* As before.
- Habitat.* Our coasts generally. On rocks at low-water mark. Not common anywhere.
- Springs occasionally in an aquarium.
-

Fig. 327. CONFERVA COLLABENS.

- Colour.* A splendid glossy, verdigris-green.
- Substance.* Soft ; gelatinous ; flabby ; slippery.
- Character of Frond.* A large tuft of long, straight, jointed threads (*filaments*), unbranched ; growing from a piece of deal. Filaments of extraordinarily various thicknesses.
- Joints.* From once to once and a half as long as broad ; at first filled with a very dense green colouring matter (*endochrome*), which afterwards contracts into a dark spot in the centre.
- Measurement.* Three or 4 inches long.
- Fructification.* Minute seeds (*zoospores*) formed of the colouring matter in the joints, collected into a round central mass (*sporidium*), which in due time bursts out.
- Habitat.* Once found upon floating timber on the beach at Yarmouth.

Now *Hormotrichum collabens*.

324.



Cladophora albida, Kütz.

325.



Cladophora falcata, Harv.

326^a



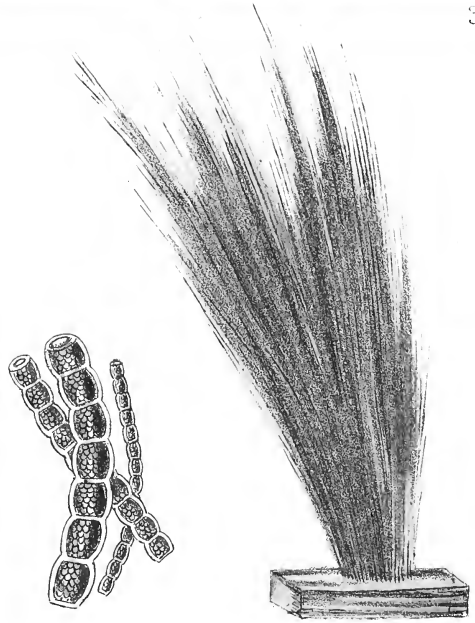
Conferva (*ærea*, Dillw.)

326^b



Conferva (*melagonium*, Web.)

327.



Conferva collabens, Ag.

PLATE LXX.

Fig. 328. CONFERVA BANGIOIDES.

Colour. Dark and very glossy green.

Substance. Very gelatinous; soft; sticky.

Character of Frond. Long, dense tufts of close-clinging, slender, wavy, jointed threads (*filaments*), unbranched. Filaments rather finer than horse-hair.

Joints. About twice as long as broad; at first quite filled with light green colouring matter (*endochrome*), which afterwards contracts into a dark green spot in the centre.

Measurement. From 3 to 6 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, collected into a round central mass (*sporidium*), which in due time bursts out.

Habitat. Breakwater, Plymouth. Torquay. Port Ballantoe, N. Ireland. On rocks, &c. near low-water mark.

Now *Hormotrichum bangioides*. Like, but larger and longer than *C. Youngana*. Easily known from most *Confervas* by its glossiness and soft gelatinous feel. From *C. collabens* by its quite different colour. For other *Confervas*, see Plate LXXII. It should be observed that such *Confervas* (and *Lyngbyas*) as have been removed to the genus *Hormotrichum* are remarkable for their soft, gelatinous substance, the shortness of their joints, and the contraction of their *endochrome*, at maturity, into a central spot.

Fig. 329. ENTEROMORPHA INTESTINALIS.

Colour. A full green; but apt to fill with sand or dirt, and become discoloured. Fading to yellow and white.

Substance. Membranaceous; thin.

Character of Frond. Cylindrical; tubular; unbranched; inflated like a delicate green bag; widening upwards to a round broad end; tapering to a mere thread at the base; more or less wrinkled and curled throughout; several rising from a minute root; attached, therefore, at first, but afterwards floating.

Measurement. Often 2 feet or more long, but sometimes not more than an inch. Of every width between $\frac{1}{10}$ of an inch and 3 inches.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the cells of which the frond-membrane is composed; and in due time bursting through them.

Habitat. Our coasts generally. In brackish ditches also; and occasionally in inland waters. In a pond in the kitchen-garden at Bishopthorpe Palace, York. Very common.

Narrow forms resemble *E. compressa*, but there is an unfailing rule for knowing them apart. *E. compressa* is always somewhat branched, however little. *E. intestinalis* is always perfectly simple.

Fig. 330. ENTEROMORPHA COMPRESSA.

Colour. A pleasant, bright grass-green ; fading pale, yellow, and white.

Substance. Membranaceous ; thin.

Character of Frond. Cylindrical or somewhat compressed ; occasionally thread-like (*filamentous*) ; tubular ; more or less branched. Branches alternate ; widening gradually upwards ; blunt at the tips ; tapering to a mere thread at the base ; sometimes simple, sometimes re-branched again and again. Occasionally contracted at intervals as if tied in. Tips blunt throughout.

Measurement. From $\frac{1}{4}$ of an inch to 12 inches long. Of every width from a *hairsbreadth* to $\frac{1}{2}$ of an inch.

Fructification. As in the preceding.

Habitat. On every coast everywhere. In brackish ditches also, and occasionally in inland waters. In a large sheet—almost a lake—in Clomber Park. Very common.

Varying as this plant does in size, amount of branching, and bushiness, it may always be recognised among other *Enteromorphas* by the blunt tips and tapering bases of its branches. In one curious variety the stems are one-sixth of an inch wide, fringed all over with hair-like branchlets.

Fig. 331. ENTEROMORPHA LINKIANA.

Colour. A very pale green.

Substance. Membranaceous, but firm ; rigid when dry.

Character of Frond. Thread-like (*filamentous*) ; cylindrical ; tubular ; inflated ; rising with a main stem, set with branches on every side. Branches long, slender, between erect and spreading, tapering to the tips ; re-branched with a second similar set, only finer ; these with a third, quite hair-like. Tips pointed throughout.

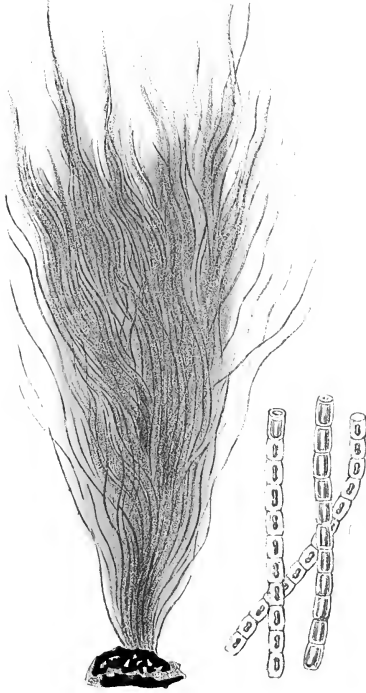
Measurement. From 6 to 12 inches long.

Fructification. As before.

Habitat. Appin ; once found.

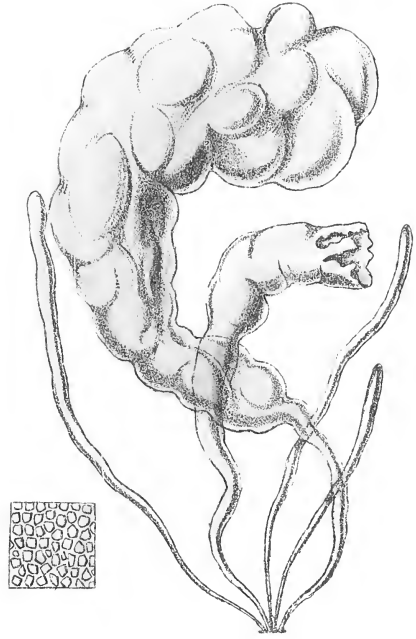
The microscopic characters of this plant are very like those of *E. clathrata*, *E. erecta*, and *E. ramosa*. The branches are wider, however, than those of *E. clathrata*, and it has not the thorny branchlets of any of the three.

328.



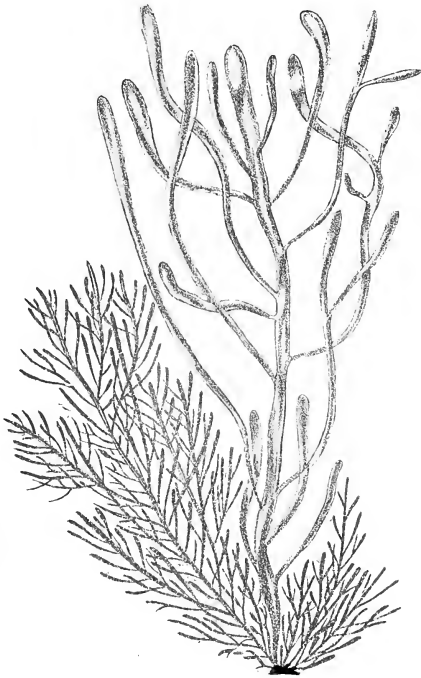
Conferva bangioides, Harv.

329.



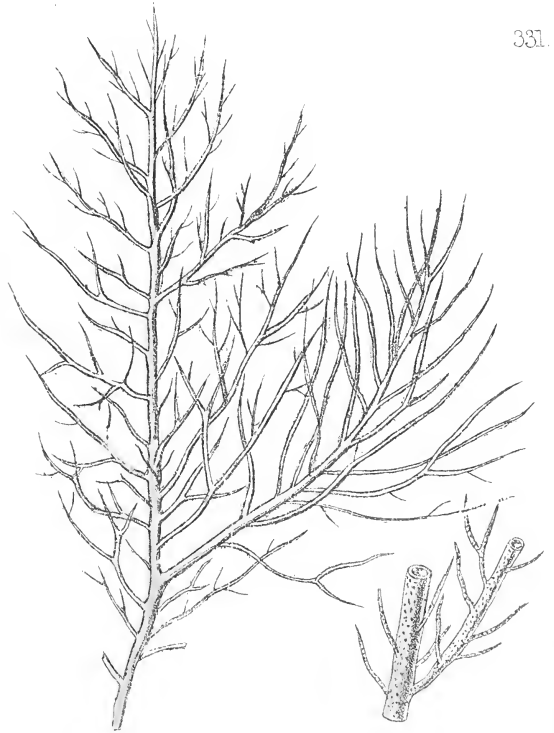
Enteromorpha intestinalis, Link.

330.



Enteromorpha compressa, Gray

331.



Enteromorpha linidama, Gray

PLATE LXXI.

Fig. 332. ENTEROMORPHA ERECTA.

Colour. A pleasant, light grass-green.

Substance. Membranaceous; thin; soft.

Character of Frond. Thread-like (*filamentous*); cylindrical; tubular; rising with a (generally) undivided main stem, closely set with opposite or alternate undivided branches; the lowermost longest; all tapering at the tips. Branches clothed throughout with short, slender, almost hair-like, spreading branchlets, which give the plant a feathery appearance. All the tips finely pointed.

Measurement. From 4 to 8 inches long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the cells of which the frond-membrane is composed; and in due time bursting through them.

Habitat. Our coasts generally. On rocks and in pools between tide-marks. Not uncommon.

The above description applies to the strictly characteristic specimens of the species; so-called *typical forms*, that is. But intermediate ones abound, which are neither exactly *E. erecta* nor yet *E. clathrata*, *ramulosa*, or *Linkiana*, but combinations from them; and Dr. Harvey is of opinion that these four species are but one, under different circumstances of growth. For the present, however, the variations take rank as typical characters; and all that a collector can do, is to place his *intermediates* in the set they come nearest to, on the whole. He cannot go far wrong so long as he keeps those with pointed tips clear of those with blunt ones. In the *Nereis Boreali-Americana*, *E. erecta* and *E. ramulosa* are referred to *E. clathrata*.

Fig. 333. ENTEROMORPHA CLATHRATA.

Colour. A delicate grass-green.

Substance. Membranaceous; thin; soft.

Character of Frond. Thread-like (*filamentous*); cylindrical; tubular; bushy; rising with a (generally) undivided main stem, closely set with branches on every side; all tapering to the tips; occasionally interwoven and spreading in fleeces. Branches several times re-branched; everywhere thickly clothed with short, hair-like, wide-spread, or back-curved branchlets. All the tips finely pointed.

Measurement. From 2 to 12 inches long.

Fructification. As before.

Habitat. Our coasts generally. On rocks between tide-marks. Not uncommon.

Distinguishable from *E. ramulosa* by its greater slenderness, softness, and more profuse branching.

Fig. 334. ENTEROMORPHA RAMULOSA.

Colour. A full grass-green.

Substance. Membranaceous, but harsh feeling; the thorn-like branchlets bristling when the plant is lifted from the water.

Character of Frond. Thread-like (*filamentous*); rather compressed than cylindrical; tubular; much branched, twisted, and interwoven; when old, spreading in fleeces. Main stems long, wavy; set with branches on every side; spreading all ways; all tapering to the tips. Branches re-branched; everywhere covered with very short, thorn-like, horizontal branchlets. All the tips finely pointed.

Measurement. From 2 inches to a foot or two long.

Fructification. As before.

Habitat. Our coasts generally. On rocks between tide-marks. Not uncommon.

Characteristic, really *thorny* specimens are very pretty, and easy to distinguish by their bristling crispness and full green hue. Dr. Harvey describes it as spreading widely in fleecy masses in its old age, and thus "forming a comfortable cover for a variety of small crustacea and shell-fish, who, no doubt, feel it quite their own."

Fig. 335. ENTEROMORPHA HOPKIRKII.

Colour. A pleasant light green.

Substance. Membranaceous; thin; very soft.

Character of Frond. Long tufts of ultra-fine-hair-like (*byssoid!*) cylindrical, tubular threads (*filaments*), excessively branched. Main divisions long, wavy, tapering to the tips. Branches upright; opposite or alternate; repeatedly divided; springing from all sides; set profusely with minute cobwebby branchlets; all the tips finely pointed.

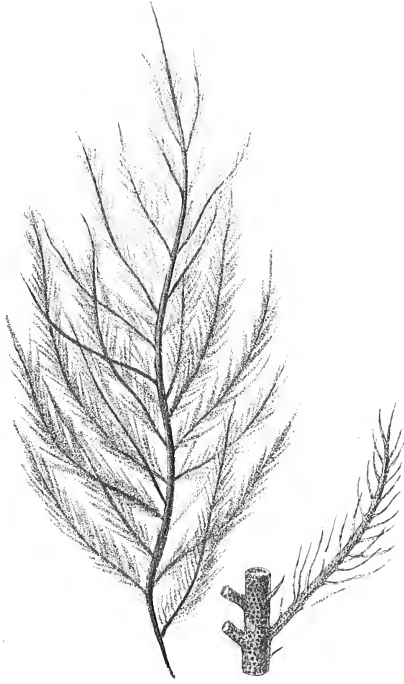
Measurement. From 6 to 12 inches long.

Fructification. As before.

Habitat. Carrickfergus. Goodington. Torbay. Dredged in from four to ten fathoms' water. Rare.

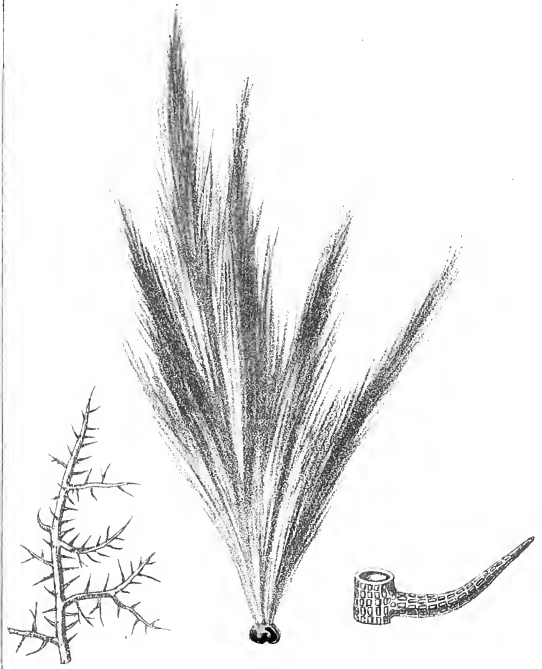
As delicate as the most delicate of the *Cladophoras*. Under the microscope, remarkable for the large size of the cells of which the frond is composed; and that these are empty, all but a minute grain of bright green colouring matter (*endochrome*) in the middle. As the branchlets are formed of only *one* row of these cells, they appear to be jointed like those of a *Cladophora*.

332.



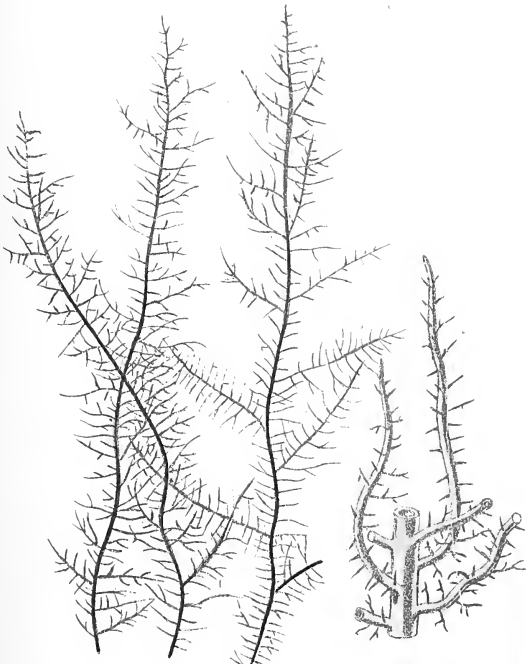
Enteromorpha erecta, Hook

333.



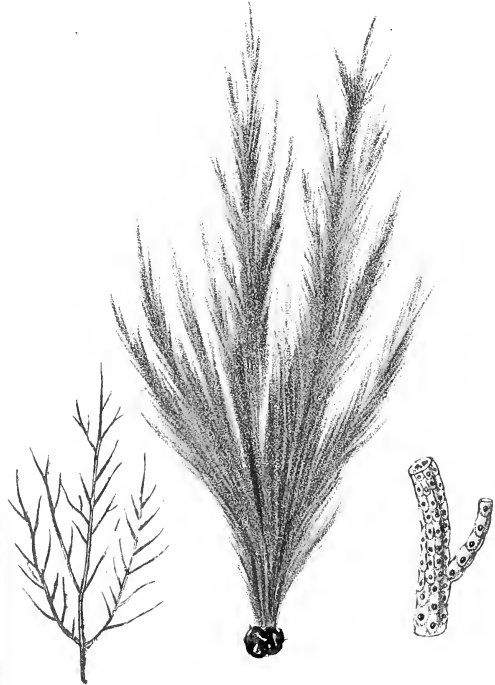
Enteromorpha clathrata, Grv.

334.



Enteromorpha ramulosa, Hook

335.



Enteromorpha Hopkinii, M^o Coda

PLATE LXXII.

Fig. 336. CONFERVA SUTORIA.

Colour. Dark green.

Substance. Soft.

Character of Frond. Thread-like (*filamentous*); jointed; forming floating and loosely entangled fleeces in ditches and pools. Filaments almost the thickness of a hog's bristle, equal throughout; very long, wavy, unbranched.

Joints. Once and a half as long as broad; filled with green colouring matter (*endochrome*).

Measurement. Indefinite.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, and in due time bursting through them.

Habitat. Wisbeach, &c. In ditches and pools subject to the influence of the tides; sometimes found growing with *C. Linum*.

Like *C. Linum*, but a much slenderer plant, with longer-proportioned joints.

Fig. 337. CONFERVA YOUNGANA.

Colour. Grass-green; not glossy when dry; fading to a dull brownish-orange in the herbarium.

Substance. Soft, but firm. Rather woolly to the touch when dry.

Character of Frond. Short (or sometimes long), dense tufts of jointed threads (*filaments*), spreading over the surface of rocks and wood-work. Filaments as fine as human hair; straight, or nearly so; clinging together; unbranched.

Joints. Very variable in length. Generally once and a half as long as broad, but sometimes twice as long, and sometimes only half; at first, quite filled with dense, bright green endochrome, which afterwards contracts into a dark spot in the centre.

Measurement. One or 2 inches high.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, collected into a round central mass (*sporidium*), which in due time bursts out.

Habitat. Our coasts generally. Near Dunraven Castle. Filey, &c. Not uncommon.

Now *Hormotrichum Younganum*. See under Fig. 328.

Fig. 338. OCHLOCHÆTE HYSTRIX.

Colour. Pale green.

Substance. Harsh, for so *infinitesimally*-sized a plant!

Character of Frond. A minute hairy patch formed of jointed threads (*filaments*), radiating from a centre, and so forming a round dot. The filaments somewhat branched, and usually sending up long, stiff, transparent, unjointed bristles from almost every joint.

Measurement. A homœopathic globule!

Fructification. Unknown.

Habitat. In brackish water near the coast; and sometimes in inland ditches, on stems of grasses, leaves of mosses, &c. Very rare.

The plate is incorrect in representing the bristles as *green*, they are colourless and transparent.

Fig. 339. ENTEROMORPHA CORNUCOPIÆ.

Colour. Dark green below ; pale above.

Substance. Membranaceous ; thin.

Character of Frond. Tubular, inflated, bag-like, widening suddenly upwards from a thread-like base ; by degrees spreading at top like a funnel, and finally torn and open.

Measurement. About an inch high.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the cells of which the frond-membrane is composed, and in due time bursting through them.

Habitat. On corallines in rocky pools left by the tide. Not "generally observed."

So very like a dwarf variety of *E. intestindis*, that Dr. Harvey hesitates about it. The species was constituted by a well-known algologist now dead, and for the present stands.

Fig. 340. ENTEROMORPHA PERCURSA.

Colour. Bright grass-green ; fading when dry.

Substance. Membranaceous ; soft.

Character of Frond. Entangled tufts of very slender (almost hair-like) threads (*filaments*) spreading widely on oozy shores. Filaments nearly solid, but just tubular, so as to keep up the character of an *Enteromorpha* ; rather more twisted than in *E. Ralfsii* ; simple and unbranched, or bearing (rarely) a few short, slender, spine-like branchlets.

Measurement. Several inches long. Two or more (but generally only two) cells forming its almost hairsbreadth width. The cells small (compared with those of *E. Ralfsii*) ; square ; the colouring matter (*endochrome*) nearly filling them, and being subdivided into four infinitesimal portions.

Fructification. As before.

Habitat. On muddy sea-shores above half-tide level.

These last two figures are misplaced on the plate.

Fig. 341. ENTEROMORPHA RALFSII.

Colour. Bright grass-green ; fading when dry.

Substance. Membranaceous ; soft.

Character of Frond. Entangled tufts of very slender (almost hair-like) threads (*filaments*) spreading widely on oozy shores. Filaments nearly solid, but just tubular ; so as to keep up the character of an *Enteromorpha* ; simple and unbranched, or bearing a few short, slender, spine-like branchlets.

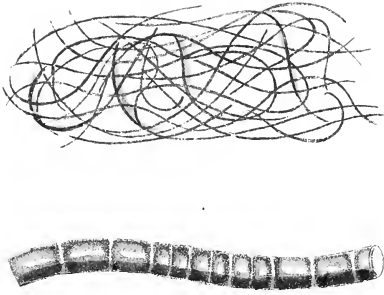
Measurement. Several inches long. From 2 to 4 cells forming its almost hairsbreadth width ! The cells large (compared to those of *E. percursa*) ; oblong, transparent ; each containing a central grain of bright green colouring matter (*endochrome*).

Fructification. As before.

Habitat. On muddy sea-shores above half-tide level. Mr. Ralfs.

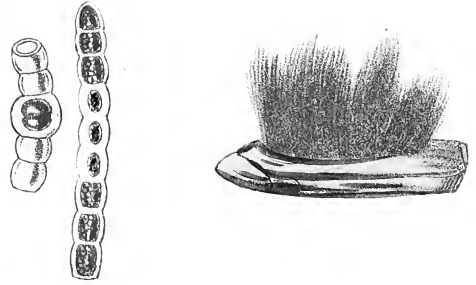
The characters which separate this plant from *E. percursa* are *microscopic*, in more senses than one, as a comparison of the descriptions will show. In *E. Ralfsii* the *endochrome* forms a minute dot in the centre of a transparent cell ; in *E. percursa* it is a square mass, and nearly as large as the cell itself. See Figs. 340 and 341.

336



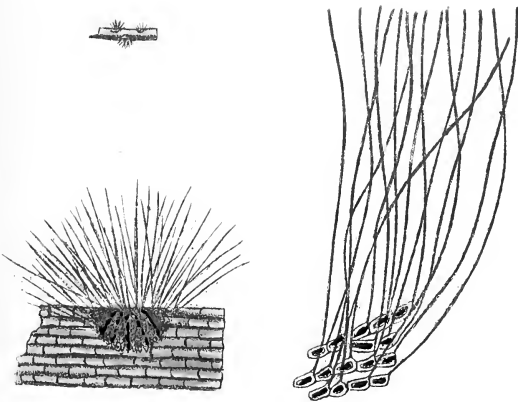
Conferva sutoria, Berk.

337.



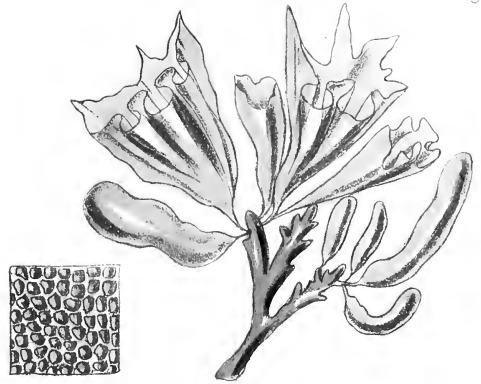
Conferva Youngiana, Dillw.

338.



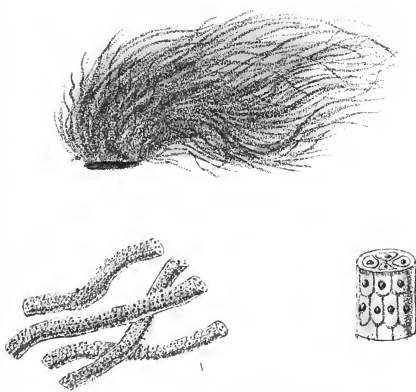
Ochlochaete hystrix, Thwaites.

339



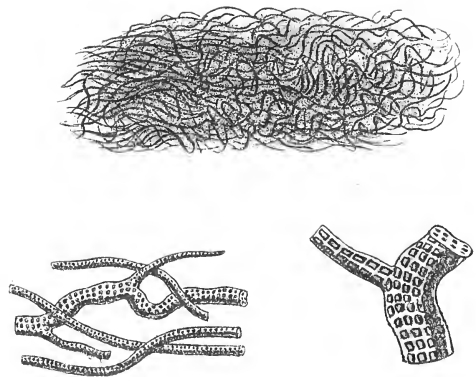
Enteromorpha cornucopiae, Hook.

341.



Enteromorpha hirsuta, Harv.

340.



Enteromorpha flexilis, Stack.

PLATE LXXIII.

Fig. 342. ULVA LATISSIMA.

Colour. A full, bright green ; darker from deep water ; fading pale ; sometimes turning brown in drying.

Substance. Membranaceous ; but quite crisp when fresh.

Character of Frond. A ribless expansion of very irregular shape ; broad or oblong ; simple or divided ; wavy or flat ; often plaited ; one or more growing together from one base.

Measurement. From 6 inches to 2 feet long ; from 3 to 12 inches wide.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the cells of which the frond-membrane is composed ; and in due time bursting through them.

Habitat. Our coasts generally. On rocks, &c. between tide-marks. Very common.

Called "green laver," in contradistinction to the *purple laver* (*Porphyra laciniata*). Some authors call this species *Phycoseris latissima* ; thus separating it from the true *Ulvas*, which have the frond-membrane composed of only *one* layer of little cells (*cellules*) ; whereas that of *Ulva latissima* is composed of *two*. Dr. Harvey, however, retains both under the genus *Ulva*, but points out the difference. This is only to be ascertained by dissection and examination under a microscope ; but as a membrane with two cells is naturally thicker than those with but one, the firmer texture forms a distinguishing mark between this plant and the following.

Fig. 343. ULVA LACTUCA.

Colour. A pleasant light green, fading to yellowish ; sometimes darker when young.

Substance. Delicately membranaceous ; almost transparent ; somewhat gelatinous ; thin.

Character of Frond. When young, a puckered inflated bag ; afterwards bursting, and opening out into a flat, ribless, wavy or torn, more or less rounded expansion.

Measurement. From 3 to 6 inches long, and as much wide.

Fructification. As before.

Habitat. Our coasts generally. On rocks, &c. between tide-marks. Not so common as *U. latissima*.

This is a true *Ulva*, the frond-membrane being composed of only one layer of little cells (*cellules*).

Fig. 344. ULVA LINZA.

Colour. A fine grass-green, fading in the herbarium.

Substance. Membranaceous; soft and thin.

Character of Frond. A long, narrow, ribless, leaf-like expansion, with curled and wavy margins; either blunt or pointed at top, always tapering to the base.

Measurement. From 6 inches to 2 feet long; from $\frac{1}{2}$ inch to 2 inches wide.

Fructification. As before.

Habitat. Our coasts generally. On rocks, &c. at half-tide level. Not uncommon.

The structure of the *Ulva* has another peculiarity. It is formed of *two* membranes (each *one* cell thick) so closely laid together, that their existence as two can only be ascertained by microscopic investigation.

Fig. 345. PORPHYRA LACINIATA.

Colour. Dull purple when growing; occasionally greenish; becoming bright and very glossy when steeped in fresh water and afterwards laid out and dried.

Substance. Delicately membranaceous; sometimes extremely thin; sometimes thicker and firmer.

Character of Frond. A flat, broad, ribless expansion; sometimes irregularly divided, or torn; sometimes growing in an irregular circle from a centre root. One or more from one base.

Measurement. From 4 to 8 inches or more across.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the cells (four together) of which the frond-membrane is composed; and in due time dropping out.

Habitat. Our coasts generally. On rocks, &c. within the range of the tide. Common.

This is the *laver* sold in jars in the shops, and is a great delicacy when stewed and eaten hot with lemon-juice. But it should be served up like Hans Andersen's white snails, in a silver dish with a spirit-lamp underneath. It is called *sloke*, or *slokaun*, in Scotland and Ireland, where it is often gathered for food under that or some other odd name. At Miltown Malbay and Kilkee, it is called "*libberum*."

342.



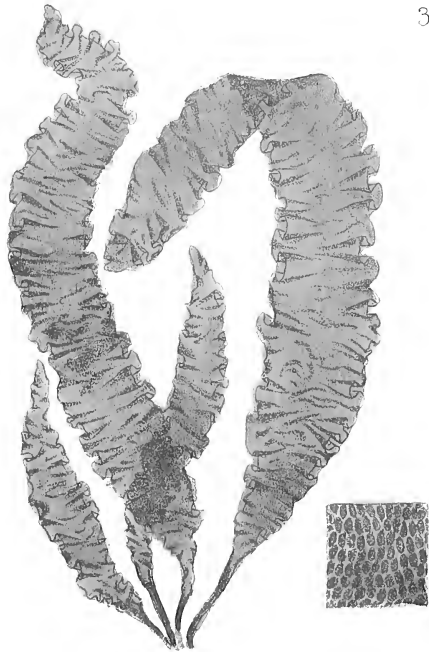
Ulva latissima, Linn.

343.



Ulva lactuca, Linn.

344.



Ulva lactuca, Linn.

345.



Ulva lactuca, Linn.

PLATE LXXIV.

Fig. 346. PORPHYRA VULGARIS.

Colour. Bright purple ; almost rosy when dry ; very glossy.

Substance. Delicately membranaceous ; very thin.

Character of Frond. A flat, narrow, ribless, leafy expansion, with a pointed end. Quite simple ; but the margins becoming more or less strongly waved and plaited as the plant grows.

Measurement. From an inch to 1 or 2 feet long. Not more than 3 inches wide, and young specimens mere threads.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the cells of which the frond-membrane is composed (four in each cell) ; and in due time dropping out.

Habitat. Our coasts generally. On rocks, &c. between tide-marks ; from high-water mark downwards.

It is almost "past a peradventure" that this plant is but a different condition of the preceding one, *Porphyra laciniata* (see last Plate). The narrowest of the specimens in Fig. 346 are found in winter or early spring covering the rocks near high-water mark with their tiny, purplish-pink, satiny fronds. Later in the season, the larger, frilled form abounds in the same locality, as also lower on the shore, where it may be found mixed with the broad divided fronds of *P. laciniata*. All are gathered indiscriminately for the table. *P. vulgaris* is rarely so dull coloured and greenish as *P. laciniata* often is ; but, on the other hand, *P. laciniata* is sometimes as bright as the other ever is. And intermediate instances both in form and colour are met with. Dr. Harvey unites the species in his *Nereis Boreali-Americana*, under the name *laciniata*.

Fig. 347. BANGIA FUSCO-PURPUREA.

Colour. Blackish-purple ; occasionally greenish ; glossy.

Substance. Tenacious ; soft ; sticky.

Character of Frond. Tufts of hair-like threads (*filaments*) ; forming a close-clinging, dark purple or greenish layer upon rocks. Filaments straight or slightly curled ; undivided ; unbranched ; tubular ; containing rows of minute colour-cells radiating from the centre.

Measurement. Filaments, several inches long ; their width variable ; narrow ones containing only one colour-cell ; others from 2 up to 5 ; these forming (with the intervals) a tessellated line across (see Figure for magnified appearance of this strictly microscopic object).

Fructification. Minute seeds (*zoospores*) formed of the colour-cells in the filaments (one to each cell) ; and in due time dropping out.

Habitat. Our coasts generally, and in fresh-water rivers and canals. On rocks, wood, &c. near high-water mark. Not uncommon.

Fig. 348. BANGIA CILIARIS.

Colour. A rosy pink.

Substance. Gelatinous; but scarcely tangible!

Character of Frond. A scarcely perceptible fringe of delicately hair-like, jointed threads (*filaments*), parasitic on other algæ. Filaments slightly tufted, or growing close together; straight; compressed; unbranched; swollen here and there; tubular; containing rows of minute colour-cells, set as if radiating from the centre (a microscopic object).

Measurement. From $\frac{1}{10}$ to $\frac{1}{8}$ of an inch long. From 2 to 3 colour-cells in width; these forming (with the intervals) a tessellated line across (see Figure).

Fructification. As in the preceding; only with two *zoospores* to each cell.

Habitat. Appin. Filey, &c. On *Zostera marina*, and various small algæ near-low-water mark. Not uncommon.

Fig. 349. BANGIA CERAMICOLA.

Colour. A purplish rose colour.

Substance. Gelatinous; soft.

Character of Frond. A delicate fringe of fine, hair-like, jointed threads (*filaments*) parasitic on other algæ. Filaments tufted or growing close together; unbranched; their joints once or twice as long as broad; slightly contracted at the partition-lines (*dissepiments*); marked with several slender, upright lines (internal colour-cells showing through), which at maturity run together (a microscopic object).

Measurement. About an inch long.

Fructification. Minute seeds (*zoospores*) formed of the line-like colour-cells in the joints; which cells then run together, and at last form a globular mass, that bursts through the cell-wall, leaving the cell empty.

Habitat. Appin. Largs, &c. On the smaller algæ in tide-pools.

Unlike other *Bangias* in structure. Moreover, much longer than *B. ciliaris*.

Fig. 350. BANGIA ELEGANS.

Colour. Rosy pink.

Substance. Soft, but scarcely tangible.

Character of Frond. A delicate fringe of fine, hair-like, jointed threads (*filaments*) parasitic on other algæ. Filaments tufted, or growing close together; repeatedly forked; the angles of branching (*axils*) rounded and very wide; tubular; containing narrow, cylindrical colour-cells, which at maturity run together (a microscopic object).

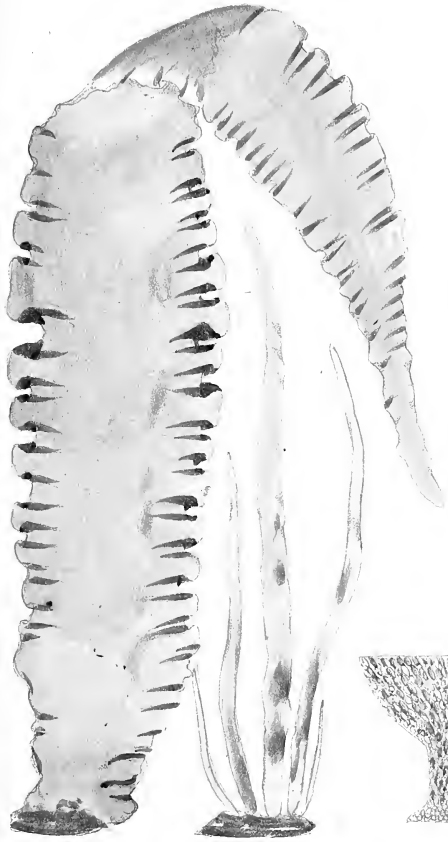
Measurement. From $\frac{1}{10}$ to $\frac{1}{8}$ of an inch long.

Fructification. Minute seeds (*zoospores*) formed of the colour-cells in the filaments; which cells then run together into diamond-shaped masses, and at last drop out.

Habitat. Strangford Lough. Parasitic on the smaller algæ. Very rare.

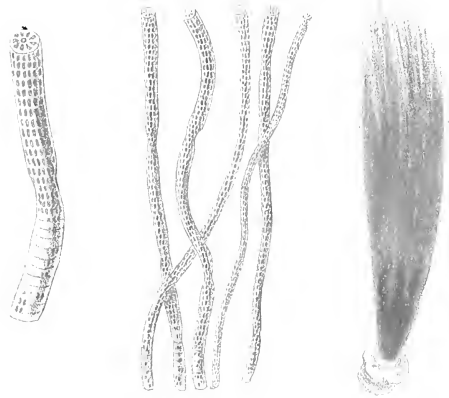
This plant also differs entirely in structure from true *Bangias*, and will probably one day be removed to a separate genus.

346.



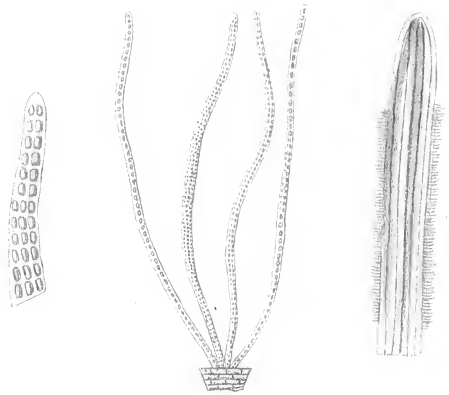
Porphyra vulgaris, Ag.

347.



Bangia fuscopurpurea, Lyb.

348.



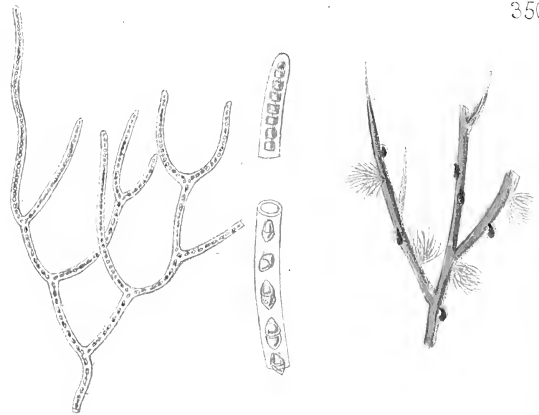
Bangia ciliaris, Carn.

349.



Bangia ceramicola, Chauv.

350.



Bangia elegans, Chauv.

PLATE LXXV.

Fig. 351. RIVULARIA PLICATA.

Colour. Dark green.

Substance. Smooth; fleshy; slimy.

Character of Frond. Small, rounded, but irregular lumps; several growing together in a mass; formed of closely-packed threads (*filaments*) radiating from a centre. At first solid; afterwards hollow and bursting.

Internal Filaments. Tubular; containing very narrow, cylindrical colour-cells, which show through, with division-lines; not branched, but lying against each other as if they were; a globular cell at the bottom of each (a microscopic object).

Measurement. The patches indefinite; each frond from $\frac{1}{10}$ to $\frac{1}{2}$ an inch wide.

Fructification. Minute seeds (*zoospores*) formed of the colour-cells in the filaments; which cells then separate from each other and drop out.

Habitat. Our coasts here and there. On rocks near high-water mark. Not uncommon.

Duller, darker coloured, and smaller than *R. nitida*.

Fig. 352. RIVULARIA ATRA.

Colour. Glossy black.

Substance. Hard; fleshy; smooth.

Character of Frond. Very minute, bead- or drop-like lumps; scattered, not massed together; formed of densely-packed threads (*filaments*) radiating outwards. Always solid.

Internal Filaments. Tubular; containing cylindrical colour-cells of various lengths, which show through, with division-lines; not branched, but lying against each other as if they were; a globular cell at the bottom of each (a microscopic object).

Measurement. Scarcely ever as large as a sweet-pea seed; generally smaller.

Fructification. As in the preceding.

Habitat. Our coasts generally. On rocks, stones, and algæ between tide-marks. Not uncommon.

Fig. 353. RIVULARIA NITIDA.

Colour. A shining deep green; sometimes verdigris when dry.

Substance. Leathery, but gelatinous; slippery feeling.

Character of Frond. Irregularly round, more or less distorted balls; several often rising together from a lumpy patch; formed of threads (*filaments*) radiating from a centre; the inner ones loosely, the outer closely packed. When young, compressed and filled with gelatine; when old, hollow and distended.

Internal Filaments. Tubular; containing narrow cylindrical colour-cells, which show through, with division-lines; not branched, but lying against each other as if they were; a globular cell at the bottom of each (a microscopic object).

Measurement. From $\frac{1}{2}$ inch to an inch across.

Fructification. As before.

Habitat. Southern shores of England. Isle of Man. South and west of Ireland. On rocks at half-tide level. Plentiful where it occurs.

Fig. 354. SCHIZOSIPHON WARRENIÆ.

Colour. Dark green.

Substance. Soft ; fleshy ; slimy.

Character of Frond. Roundish, irregularly-spreading lumps, running together, and forming a glazy crust upon rocks ; formed of closely-packed threads (*filaments*) radiating from a centre.

Internal Filaments. Tubular ; containing cylindrical colour-cells, which show through ; set in wide transparent sheaths, composed of innumerable upright, hair-like, gelatinous shreds ; so closely set as to look entire, all but the tips. A nearly globose cell at the bottom of each (a microscopic object).

Measurement. The patches spreading indefinitely.

Fructification. Minute seeds (*zoospores*) formed of the coloured cells in the filaments ; which cells then separate from each other and drop out.

Habitat. Coast of Devonshire. On rocks at high-water mark ; chiefly in places exposed to the drip of fresh water.

Fig. 355. SCHIZOTHRIX CRESWELLII.

Colour. The tuft greenish-olive ; the threads which compose it, yellowish-green.

Substance. The tufts soft ; spongy ; the threads which compose it, rigid.

Character of Frond. Dense, cushion-like tufts, spreading on the surface of rocks in round or oval patches ; composed of very slender threads (*filaments*) collected into branching bundles. Filaments curved, interlaced, branched in a forked manner (a microscopic object).

Measurement. The patches several inches across.

Fructification. Not ascertained.

Habitat. On sandstone rocks near high-water mark ; exposed to the drip of fresh water.

Fig. 356. CALOTHRIX CONFERVICOLA.

Colour. A fine, deep, metallic green ; reflecting prismatic colours under water.

Substance. Rigid for so tiny a plant.

Character of Frond. Minute, starry tufts of threads (*filaments*) only a few in each ; scattered over the fronds of other algæ, and often covering them altogether. Filaments tubular ; containing very narrow, cylindrical colour-cells, which show through, with division-lines.

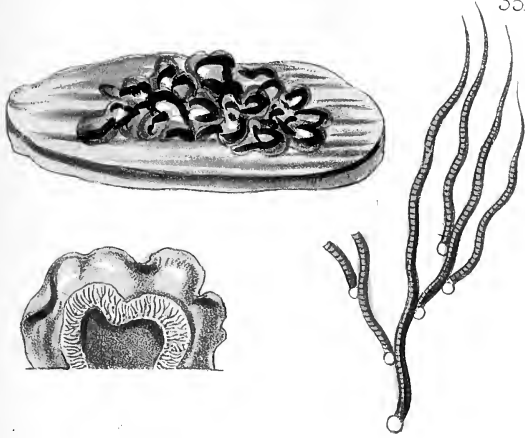
Measurement. Never more than $\frac{1}{4}$ inch high ; often less.

Fructification. As in *Schizosiphon* and *Rivularia*.

Habitat. Our coasts generally. On small algæ between tide-marks. Abundant in the autumn.

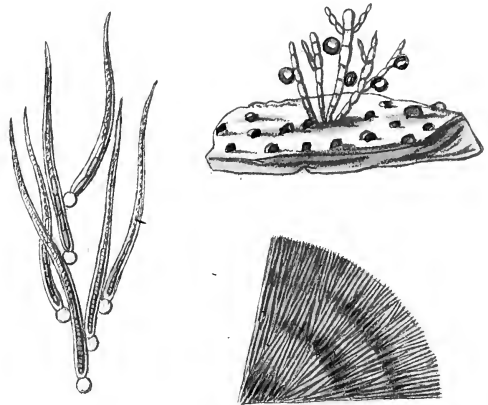
This charming little parasite, instead of disfiguring the plant on which it grows, often makes it a good deal handsomer than it was before. For instance, it is specially fond of the pale, sickly-looking *Ceramium rubrum*, which grows in high-water pools, and this it adorns with a fringe of dark green. Some unusual appearances are figured in the outer magnified form on the Plate. They are not understood.

351.



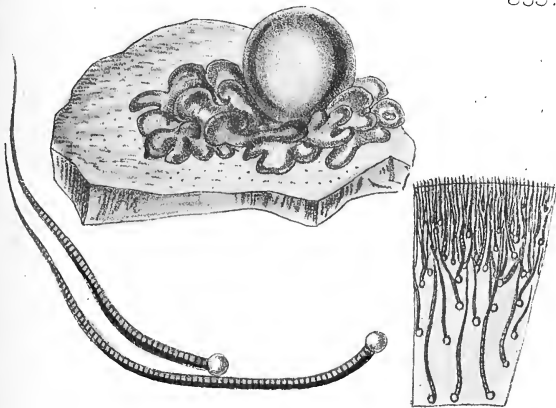
Rivularia plicata, *Corn.*

352.



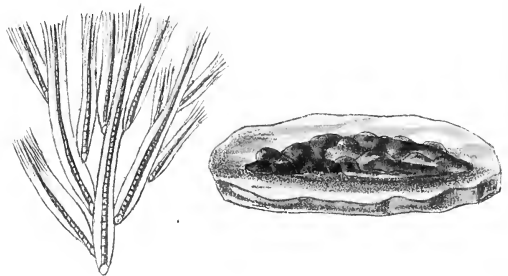
Rivularia atra, *Roth.*

353.



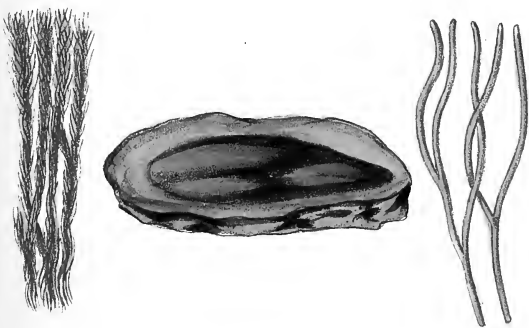
Rivularia nitida, *Ag.*

354.



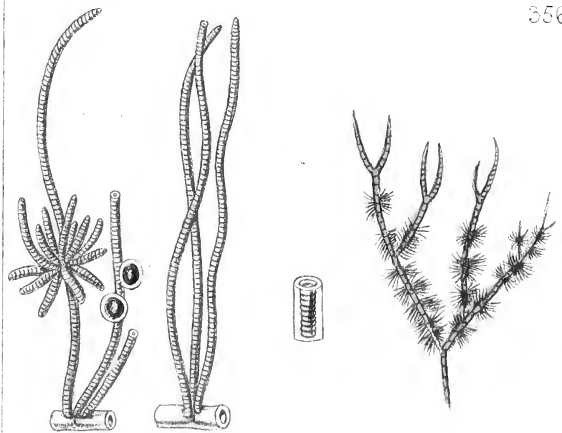
Schizosiphon Warreniae, *Casp.*

355.



Schizothrix Creswellii, *Harv.*

356.



Calothrix confervicola, *Ag.*

PLATE LXXVI.

Fig. 357. CALOTHRIX PANNOSA.

Colour. Dark green.

Substance. Rigid; wiry.

Character of Frond. Long, blunt, very much curled and twisted threads (*filaments*) densely interwoven into compressed tufts, or a sort of honeycombed layer on rocks. Filaments tubular; containing narrow, cylindrical colour-cells, which show through, with division-lines.

Measurement. The filaments $\frac{1}{2}$ an inch long; the larger spreading.

Fructification. Minute seeds (*zoospores*) formed of the colour-cells in the filaments; which cells then separate from each other and drop out.

Habitat. Roundstone Bay. Kilkee. Sidmouth. On rocks or algæ near high-water mark. Rarely observed.

For other *Calothrixes*, see Plate LXXVII.

Fig. 358. LYNGBYA MAJUSCULA.

Colour. Blackish-green.

Substance. Crisp; rigid; glutinous.

Character of Frond. Large tufts or bundles of long, very thick, curling, twisted threads (*filaments*) issuing from interwoven layers of the same. Filaments not branched, but lying together as if they were; tubular; containing very narrow, cylindrical, dull-green colour-cells, which show through; their division-lines obscure.

Measurement. Filaments 1 or 2 inches long; the layers indefinitely spreading.

Fructification. As in *Calothrix*, &c.

Habitat. Our coasts generally. On mud or sand-covered rocks at and below half-tide level; also thrown up after storms. Not uncommon.

By far the largest of British *Lyngbyas*, and like tufts of curling human hair, were it not for the *mermaid* colour.

Fig. 359. LYNGBYA FLACCA.

Colour. Bright green.

Substance. Very soft; flabby.

Character of Frond. Short tufts of straight, or gently curved, jointed threads (*filaments*), parasitic on other algæ; simple, or bearing here and there a few root-like branchlets. Filaments very slender; finer than human hair.

Joints. Half as long as broad; at first more or less filled with colouring matter (*endochrome*) which afterwards contracts into a dark spot in the centre.

Measurement. From half an inch to an inch long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, collected into a round central mass (*sporidium*), which in due time bursts out.

Habitat. Our coasts generally. (Filey.) On various algæ and in tide-pools. Not uncommon.

Now *Hormotrichum flaccum*. For other *Lyngbyas*, see Plate LXXVIII. For the characters of *Hormotrichum*, refer under Fig. 328.

Fig. 360. HORMOSPORA RAMOSA.

Colour. Pale green.

Substance. Gelatinous.

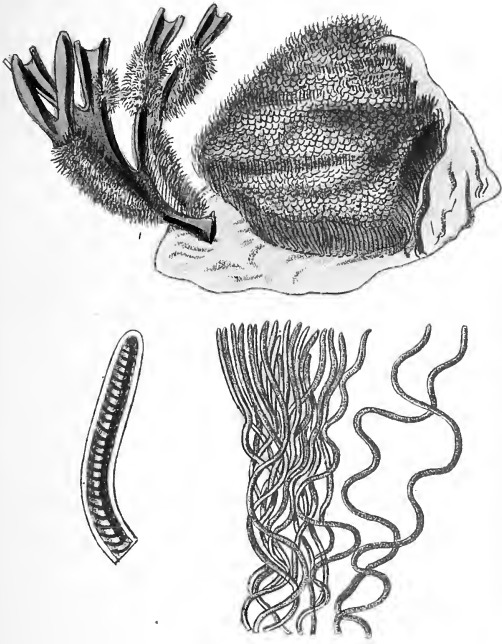
Character of Frond. Very slender, tubular threads (*filaments*); more or less branched; containing, when young, nearly cylindrical colour-cells; when mature, distinctly oval or spherical ones; the colouring matter (*endochrome*) within radiating in lines from a centre (a microscopic object).

Measurement. From $\frac{1}{4}$ to $\frac{1}{2}$ an inch high.

Fructification. Minute seeds (*zoospores*) formed of the coloured cells, which then become oval, and finally drop out.

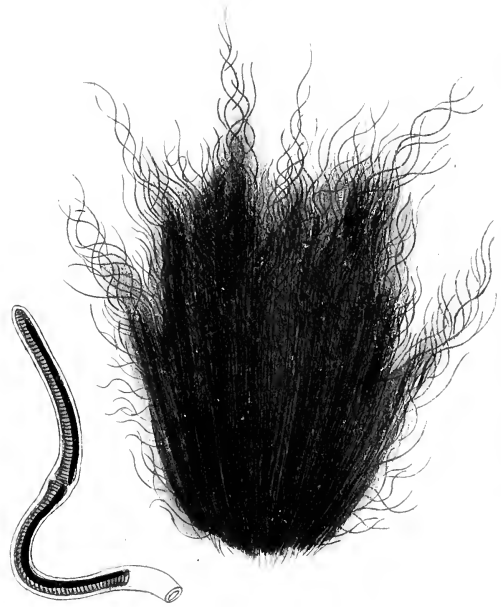
Habitat. Near Wareham, Dorsetshire, in a salt-water lake.

357.



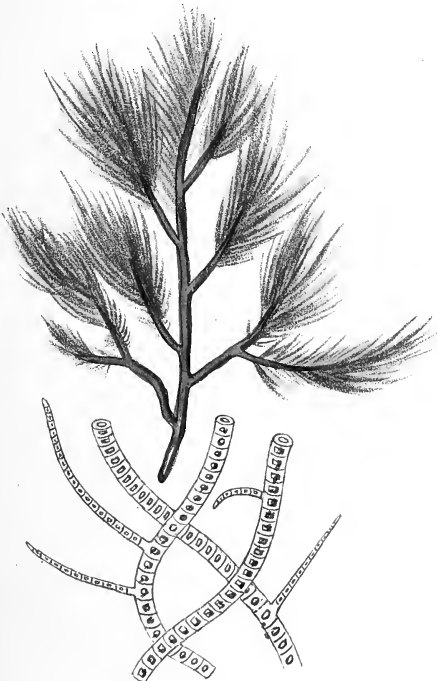
Calothrix pannosa, Harv.

358.



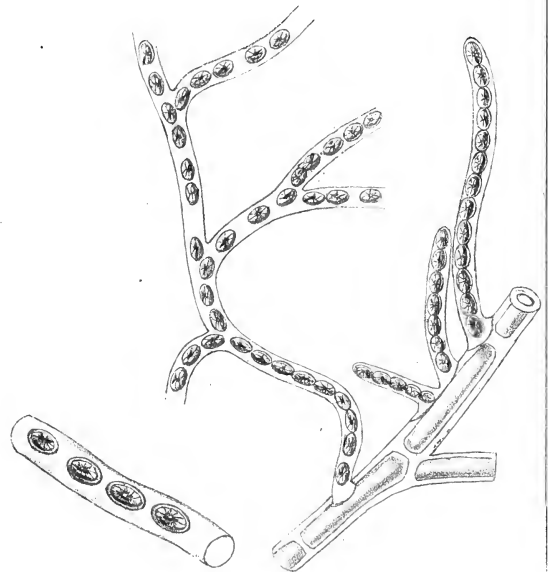
Lyngbya majuscula, Harv.

359.



Lyngbya flacca, Harv.

360.



Hormospora ramosa, Harv.

PLATE LXXVII.

Fig. 361. CALOTHRIX LUTEOLA.

Colour. Light green ; or (when the colour-cells have dropped out) pale horn-colour.

Substance. Very soft.

Character of Frond. Exceedingly slender threads (*filaments*) scattered along the stems of the lesser algæ, forming a downy fringe. Filaments unbranched ; tubular ; some containing very narrow, close-set, cylindrical colour-cells, which show through ; their division-lines faintly marked ; some partially or entirely empty from these having dropped out.

Measurement. One-tenth, or at most $\frac{1}{2}$ of an inch high !

Fructification. Minute seeds (*zoospores*) formed of the colour-cells in the filaments ; which cells then separate from each other and drop out.

Habitat. Appin ; but should be looked for elsewhere. On thread-shaped (*filiform*) algæ in tide-pools.

The word *Calothrix* is misspelt on this Plate.

Fig. 362. CALOTHRIX FASCICULATA.

Colour. Very dark, shining green.

Substance. Velvety ; very slippery to walk upon.

Character of Frond. Minute tufts of very straight, upright, finely-pointed threads (*filaments*) ; forming a spreading velvety layer upon rocks. Filaments not branched ; but sometimes surrounded at top with a set of lesser ones lying close against them, branch-like ; tubular ; containing very narrow, close-set, cylindrical colour-cells, which show through ; their division-lines strongly marked.

Measurement. Filaments $\frac{1}{2}$ or $\frac{2}{3}$ of an inch high ; the velvety layer indefinite.

Fructification. As in the preceding.

Habitat. Miltown Malbay, and probably elsewhere. Spreading over the surface of rocks about half-tide level.

Possibly only *C. scopulorum*, grown in deeper water. It is taller, straighter, darker, and occasionally appears branched above, as described.

Fig. 363. CALOTHRIX SCOPULORUM.

Colour. A dull, dirty green.

Substance. Velvety ; very slippery to walk upon.

Character of Frond. Exceedingly minute, upright, wavy threads (*filaments*) ; often finely tapering ; rising from a slimy base ; forming a spreading, velvety layer upon rocks. Filaments unbranched ; tubular ; containing very narrow, close-set, cylindrical colour-cells, which show through ; their division-lines indistinctly marked.

Measurement. One-fifth of an inch high.

Fructification. As before.

Habitat. Our coasts generally. On rocks near high-water mark. Common.

Fig. 364. CALOTHRIX SEMIPLANA.

Colour. Verdigris-green.

Substance. Rigid.

Character of Frond. Tufts of very slender, wavy threads (*filaments*); densely interwoven into compressed bundles. Filaments unbranched; tubular; containing narrow, cylindrical colour-cells; some of which are apt to run out, leaving empty transparent patches in the tubes; the rest showing through, with division-lines.

Measurement. One or 2 inches high.

Fructification. As before.

Habitat. Our coasts generally. In rock-pools near high-water mark, growing on *Corallina officinalis* and other small algæ.

Fig. 365. CALOTHRIX HYDNOIDES.

Colour. Dark olive-green (blackish under the microscope).

Substance. Rigid; plush-like, not velvety.

Character of Frond. Slender, wavy, obtuse threads (*filaments*); some interwoven into a thin, flat layer; others rising up in close, stiff, sharp-pointed tufts; forming thin patches. Filaments not branched, but lying against each other as if they were; especially above, where three or four crowd together, cohering by their ends, and bristling out in sharp points; tubular; containing narrow, cylindrical black-green colour-cells, which show through, with division-lines.

Measurement. Filaments an inch high. Patches, an inch or two across, on the clayey shore. Spreading for several feet on rocks.

Fructification. As before.

Habitat. Appin. On the clayey sea-shore near high-water mark.

Much more rigid and harsh-feeling than *C. scopulorum*, and very like pieces of *rough plush*. Known from *C. pannosa* by much shorter filaments, and the sharp tooth-like tops of the tuft-divisions.

Fig. 366. CALOTHRIX CÆSPITULA.

Colour. Blackish green.

Substance. Soft; velvety.

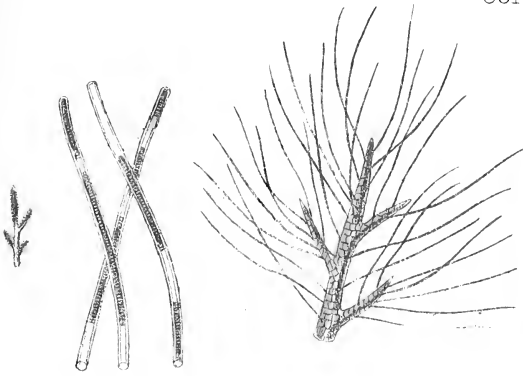
Character of Frond. Close, very round, cushion-like tufts of densely-packed threads (*filaments*). Filaments upright, wavy, blunt, often twisted into small bundles; not branched, but sometimes lying against each other as if they were; tubular; containing very narrow, cylindrical colour-cells, which show through; their division-lines very strongly marked.

Measurement. Tufts from $\frac{1}{4}$ to $1\frac{1}{2}$ inch in diameter.

Fructification. As before.

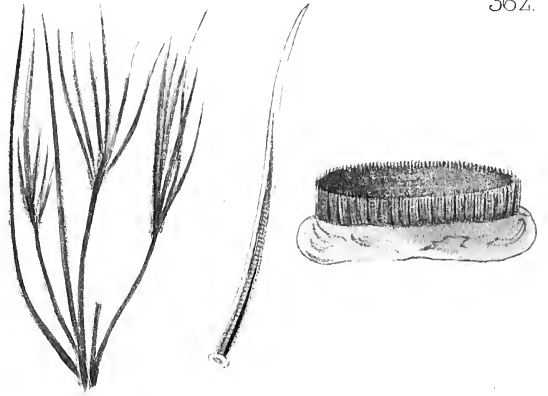
Habitat. Spanish Point at Miltown Malbay, Co. Clare. In rock-pools near high-water mark. Only once found in Ireland.

361.



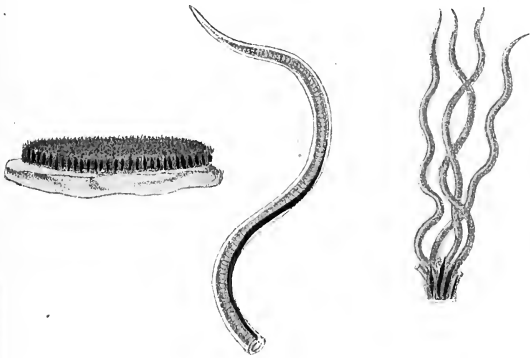
Calothrix luteola, Græv.

362.



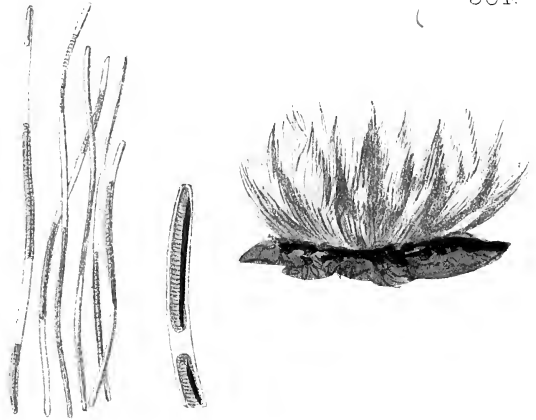
Calothrix fasciculata, Ag.

363.



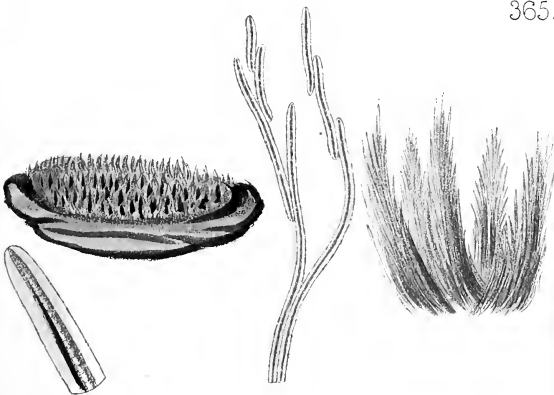
Calothrix scopulorum, Ag.

364.



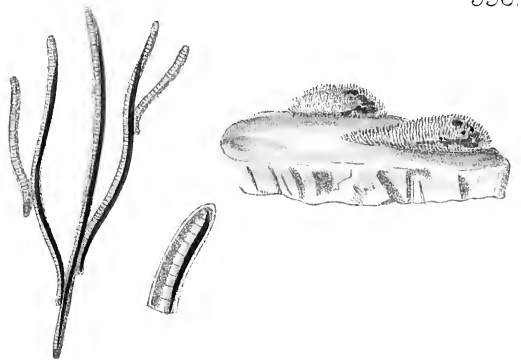
Calothrix semiplena, Ag.

365.



Calothrix hydroides, Carr.

366.



Calothrix caespitula, Harv.

PLATE LXXVIII.

Fig. 367. LYNGBYA FERRUGINEA.

Colour. A dull verdigris-green, changing to rust-colour, but resuming the green, when dry.

Substance. Soft; woolly when dry.

Character of Frond. Excessively slender threads (*filaments*) closely matted together; forming a layer at the bottom of mud-bottomed pools. Filaments bent in various curves, but not twisted; unbranched; tubular; containing narrow, cylindrical colour-cells, which show through; with tolerably clear division-lines.

Measurement. Filaments from $\frac{1}{4}$ to 1 inch high; the larger spreading for several inches.

Fructification. Minute seeds (*zoospores*) formed of the colour-cells in the filaments; which cells then separate from each other, and at last drop out.

Habitat. Appin, and elsewhere. Filey, on the rocks leading to the bridge. In small mud-bottomed pools near high-water mark. Not uncommon.

Fig. 368. LYNGBYA CARMICHÆLII.

Colour. A bright grass-green.

Substance. Soft.

Character of Frond. Very long, wavy, strongly curled, jointed threads (*filaments*); fixed at base, but forming extensive, closely-entangled, fleecy layers; floating freely under water.

Joints. Very short; scarcely half as long as broad; filled with dense green colouring matter (*endochrome*), which afterwards contracts into a dark spot in the centre.

Measurement. Almost indefinite. On *Fucus vesiculosus*, upwards of 1 foot. On rocks, covering a space of 20 or 30 yards!

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, collected into a round central mass (*sporidium*), which in due time bursts out.

Habitat. South and west coasts of England. West of Scotland. Ireland generally. On rocks, algæ, floating timber, &c.; between tide-marks and beyond.

Now *Hormotrichum Carmichaelii*. See under Fig. 328.

Fig. 369. LYNGBYA SPECIOSA.

Colour. Bright yellow-green; glossy when dry.

Substance. Soft; gelatinous.

Character of Frond. Long; thick; first straight, then curled, jointed threads (*filaments*); unbranched; fixed at base, but forming extensive, closely-entangled, fleecy layers; floating freely under water.

Joints. Very short; scarcely half as long as broad; filled with bright green colouring matter (*endochrome*), which afterwards contracts into a dark spot in the centre.

Measurement. Three or 4 inches long.

Fructification. As in *L. Carmichaelii*, but in *L. speciosa* the margins are often uneven, from the gradual dropping out of the *zoospore*-masses (*sporidia*).

Habitat. Appin. Torquay. St. Michael's Mount, &c. On rocks and algæ between tide-marks.

Now *Hormotrichum speciosum*. See under Fig. 328. The filaments are twice as robust as those of *L. Carmichaelii*, and it adheres much more closely to paper in drying.

Fig. 370. LYNGBYA CUTLERIÆ.

Colour. A brilliant light grass-green.

Substance. Very soft and delicate.

Character of Frond. Excessively slender, gently waved, jointed threads (*filaments*); unbranched; fixed at base, but forming fleecy layers; floating freely under water.

Joints. About as long as broad; filled with bright green colouring matter (*endochrome*), which afterwards contracts into a round spot in the centre.

Measurement. From $\frac{1}{4}$ to 1 inch long.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the joints, collected into a round central mass (*sporidium*), which in due time bursts out.

Habitat. In estuaries. Exmouth, Miss Cutler. But the plant should be looked for further.

Now *Hormotrichum Cutleria*.

Fig. 371. MICROCOLEUS ANGUIFORMIS.

Colour. A dull, dark green.

Substance. Soft; gelatinous.

Character of Frond. Dense layers of small, snake-like tubes, tapering at their ends, widening upwards; open at the tops; forming patches on mud. Tubes filled (when fully developed) with numbers of very minute, stiff, straight threads (*filaments*); whose tips issue from the open tops, and may be observed (under a microscope) to wave backwards and forwards (*oscillate*).

Measurement. The patches about an inch long.

Fructification. Minute seeds (*zoospores*) formed of the colour-cells in the filaments; which cells then separate, and in due time drop out.

Habitat. Coast of Wales. West of Scotland. Pools of brackish water near the shore.

Fig. 372. OSCILLATORIA LITTORALIS.

Colour. The mass verdigris-green; dried filaments deep green.

Substance. The mass slimy; filaments elastic; when dry, membranaceous; scarcely adhering to paper.

Character of Frond. A thin layer of slender, straight, or slightly-curved threads (*filaments*); generally twisted into bundles. Filaments apt to break into needle-like fragments; unbranched; tubular; containing very narrow cylindrical colour-cells, which show through; their division-lines conspicuous, at intervals of about one-third the width of the filament.

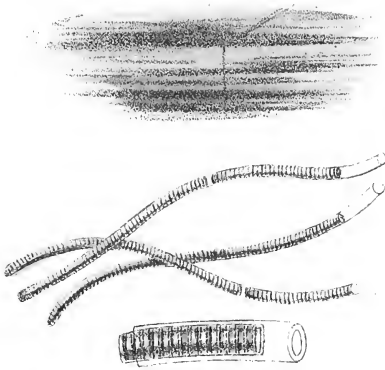
Measurement. Indefinite.

Fructification. Minute seeds (*zoospores*) formed of the colour-cells in the filaments; which cells at last separate from each other and drop out.

Habitat. Appin. In pools along the muddy sea-shore, flooded by spring tides.

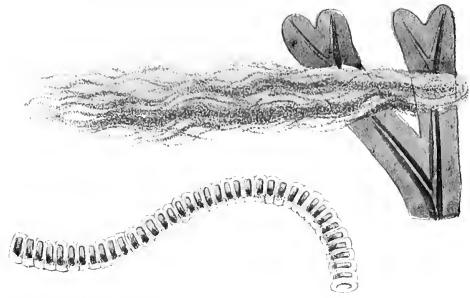
The filaments of this genus may be observed (under the microscope) waving to and fro (*oscillating*) as if possessed of animal life. For this purpose a morsel should be placed in a glass with a few drops of water. The reason of this curious fact is not known.

367.



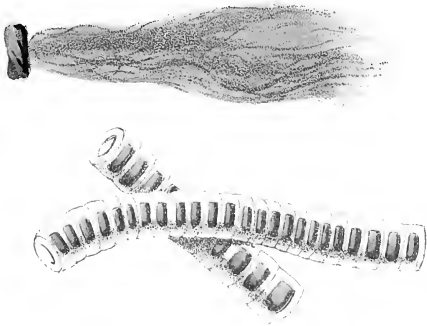
Lyngbya ferruginea, Ag

368.



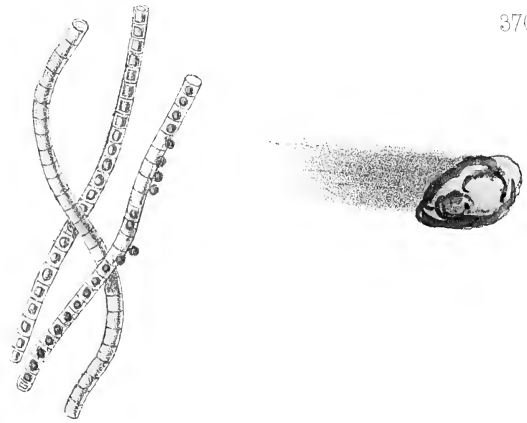
Lyngbya Carmichaelii, Harv.

369.



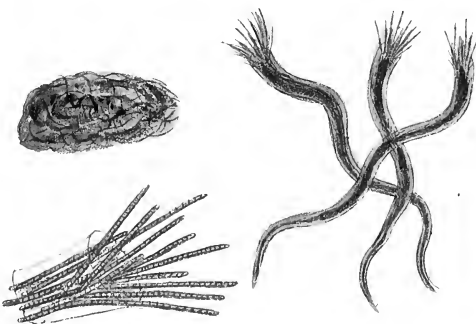
Lyngbya speciosa, Carm

370.



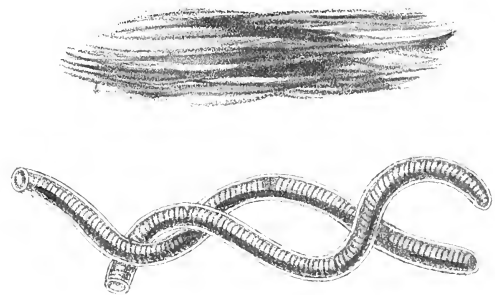
Lyngbya Cutleriae, Harv.

371.



Microcoleus anguiformis, Harv.

372.



Oscillatoria litoralis, Carm.

PLATE LXXIX.

Fig. 373. OSCILLATORIA SPIRALIS.

Colour. The layer greenish-black, or verdigris; glossy; dried filaments the same.

Substance. The layer sometimes leathery, sometimes membranaceous; scarcely gelatinous; filaments rigid.

Character of Frond. A more or less thin layer of short, slender, jointed threads (*filaments*), stiffly curled and twisted; turned in all directions; densely interwoven. Filaments apt to break into short fragments; unbranched; tubular; containing narrow, cylindrical colour-cells, which show through, with division-lines.

Measurement. The larger layers sometimes several feet in extent. Filaments about $\frac{1}{20}$ of an inch long!

Fructification. Minute seeds (*zoospores*) formed of the colour-cells in the filaments; which cells at last separate from each other and fall out.

Habitat. Our coasts generally. On rocks above and between tide-marks; often left dry.

The waving to-and-fro (*oscillating*) movement of *Oscillatoria* filaments has been mentioned under Fig. 372.

Fig. 374. SPIRULINA TENUISSIMA.

Colour. Rich metallic, or verdigris-green.

Substance. The layer very gelatinous; slimy.

Character of Frond. A thin film of excessively slender, wavy, densely-twisted threads (*filaments*), lying nearly parallel. Filaments unbranched; tubular; containing bright green colour-cells, which show through; their division-lines close, and more or less distinct.

Measurement. The layer $\frac{1}{2}$ of an inch or more across.

Fructification. As above, in *Oscillatoria*.

Habitat. On decaying algæ, sticks, &c. in brackish pools near Menai Bridge. Pool near Dolgelly. Aberdeen.

The filaments of *Spirulina*, like those of *Oscillatoria* and *Microcoleus*, have, when alive and under water, the to-and-fro movement called oscillation, and in *Spirulina* the movement is particularly vivid.

Fig. 375. OSCILLATORIA NIGRO-VIRIDIS.

Colour. The layer a very dark olive-green, almost black; dried filaments pale green.

Substance. The layer soft; gelatinous; filaments rigid.

Character of Frond. A thick layer of very slender threads (*filaments*), with distinctly curved, blunt tips; at first growing on mud, afterwards floating. Filaments apt to break into needle-like fragments; unbranched; tubular; containing pale green colour-cells, which show through; their division-lines inconspicuous; set at intervals of about half the width of the filament.

Measurement. Indefinite.

Fructification. As before.

Habitat. Shirehampton, Bristol. In a brackish ditch.

Fig. 376. OSCILLATORIA SUBULIFORMIS.

Colour. The layer looking blackish under water ; when taken out a beautiful deep blue-green ; filaments bright green.

Substance. The layer soft ; gelatinous.

Character of Frond. A thinish layer of very slender threads (*filaments*), awl-shaped, with pointed tips ; at first growing on mud, afterwards floating. Filaments apt to break into needle-like fragments ; unbranched ; tubular ; containing bright green colour-cells, which show through ; their division-lines inconspicuous ; set at intervals of from half to three-fourths the width of the filament.

Measurement. Indefinite.

Fructification. As before.

Habitat. Shirehampton, Bristol. In a brackish ditch. Found with the preceding, *O. nigroviridis*.

The oscillations of *O. subuliformis* are very vivid.

Fig. 377. OSCILLATORIA INSIGNIS.

Colour. The layer dark brown, almost black ; filaments brown.

Substance. Soft ; gelatinous.

Character of Frond. A thin layer of large brittle threads (*filaments*), slightly curved, with blunt tips fringed with short, cobweb-like fibres. Filaments apt to break into needle-like fragments ; unbranched ; tubular ; containing brown colour-cells, which show through ; their division-lines conspicuous and very close.

Measurement. The layer indefinite ; filaments larger than those of any other marine *Oscillatoria*.

Fructification. As before.

Habitat. Shirehampton, near Bristol. In a brackish ditch. Found with the two preceding.

The fringed tips occur in other *Oscillatorias*, but are more easily observed in this one, from the much greater thickness of the filaments.

Fig. 378. MONORMIA INTRICATA.

Colour. At first olive-yellow ; gradually greenish ; when dry, deep verdigris-green.

Substance. Very gelatinous and soft.

Character of Frond. A small, roundish, floating mass ; formed of single threads (*filaments*), densely curled and twisted ; immersed in loose, gelatinous, tube-like cylinders ; several times branched. Filaments formed of globose cells, filled with colouring matter (*endochrome*) ; strung together ; a larger cell, of different character, interrupting the uniformity here and there (a microscopic object).

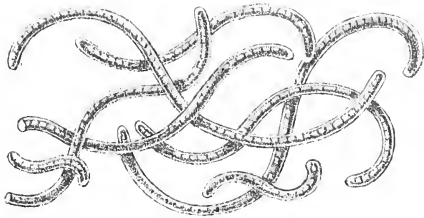
Measurement. The little mass $\frac{1}{4}$ of an inch across.

Fructification. Minute seeds (*zoospores*) formed of the colouring matter in the usual cells of the filaments, and in due time bursting through them.

Habitat. Gravesend. In the ditches of the marsh to the south of the Frindsbury canal. Very abundant.

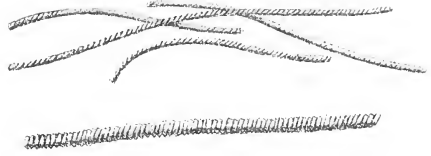
Sometimes found with, and even inside, *Enteromorpha intestinalis* ; and in fresh water.

373.



Oscillatoria spiralis, *Carm.*

374.



Spirulina tenuissima, *Mütz.*

375.



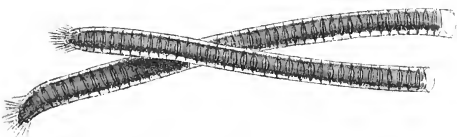
Oscillatoria nigro-viridis.

376.



Oscillatoria subuliformis, *Thw.*

377.



Oscillatoria insignis, *Thw.*

378.



Monormia intricata, *Berk.*

PLATE LXXX.

Fig. 379. SPHÆROZYGA CARMICHÆLII.

Colour. The filmy patches vivid green.

Substance. Gelatinous; slimy.

Character of Frond. A thin film, consisting of minute, straight, brittle threads (*filaments*), tapering to each end; unbranched; lying in a layer of jelly.

Filaments. Formed of bead-like colour-cells; a larger, colourless one (called the connecting cell), fringed with hairs, intermixed here and there. At maturity, some of the colour-cells run together, forming larger ones (a microscopic object).

Measurement. Patches $\frac{1}{8}$, filaments $\frac{1}{40}$ of an inch long!

Fructification. Minute seeds (*zoospores*) formed in the enlarged colour-cells, which are then oblong, twice or thrice as long as broad, and brownish.

Habitat. Appin. Menai Bridge, &c. On decaying heaps of algæ. Also in brackish water.

Fig. 380. SPHÆROZYGA THWAITESII.

Colour. Patches deep green; almost black; filaments pale green.

Substance. Very gelatinous; slimy.

Character of Frond. Filmy patches, consisting of minute, curved, entangled threads (*filaments*); unbranched; lying together in a layer of jelly.

Filaments. Formed of bead-like colour-cells; a larger, lighter-coloured one (called the connecting cell), fringed with hairs, intermixed here and there (generally near the ends). At maturity, some of the colour-cells run together, forming larger ones (a microscopic object).

Measurement. Patches $\frac{1}{8}$, filaments $\frac{1}{40}$ of an inch long.

Fructification. Minute seeds (*zoospores*) formed in the enlarged colour-cells, which are then oval, once and a half as long as broad, and brown.

Habitat. Dolgelly. Shirehampton. On muddy sides of brackish water, or floating.

Fig. 381. SPERMOSIRA LITTOREA.

Colour. Deep green.

Substance. Membranaceous; scarcely gelatinous.

Character of Frond. A fleecy layer of robust, nearly straight threads (*filaments*); unbranched; tubular; filled with very narrow, closely-packed colour-cells; a rather wider, pale reddish one (called the connecting cell) intermixed here and there. At maturity, some of the colour-cells run together, forming larger ones (a microscopic object).

Measurement. Fleecy layers $\frac{1}{2}$ inch long; filaments as fine as human hair.

Fructification. Minute seeds (*zoospores*) formed in the enlarged colour-cells, which are then oval and brown.

Habitat. In muddy, brackish water.

Fig. 382. SPHÆROZYGA BROOMEI.

Colour. Deep green.

Substance. Gelatinous ; slimy.

Character of Frond. Filmy patches, consisting of minute straight threads (*filaments*) ; unbranched ; lying together in a layer of jelly.

Filaments. Formed of bead-like colour-cells, with here and there a larger, squarish, colourless one (called the connecting cell) intermixed. At maturity, some of the colour-cells run together, forming larger ones (a microscopic object).

Measurement. Patches $\frac{1}{8}$, filaments $\frac{1}{40}$ of an inch long.

Fructification. Minute seeds (*zoospores*) formed in the enlarged colour-cells, which are then oval, twice as long as wide, not much wider than the ordinary cells, and brown.

Habitat. In a brackish ditch at Shirehampton. On dead leaves.

Fig. 383. SPHÆROZYGA BERKELEYANA.

Colour. Vivid green.

Substance. Very gelatinous ; slimy.

Character of Frond. Filmy patches, consisting of minute curved threads (*filaments*) ; unbranched ; lying together in a layer of jelly ; the younger ones often enclosed, several together, in a distinct gelatinous sheath. (See Figure.)

Filaments. Formed of bead-like colour-cells, with here and there a larger, slightly-compressed, colourless one intermixed. At maturity, some of the colour-cells run together, forming larger ones (a microscopic object).

Measurement. Patches $\frac{1}{8}$, filaments perhaps $\frac{1}{20}$ of an inch long.

Fructification. Minute seeds (*zoospores*) formed of the enlarged colour-cells, which are then oblong, twice the width of the ordinary cells, and brown ; and lie, generally in pairs, on each side a connecting cell.

Habitat. In a brackish ditch at Shirehampton. Amongst the filaments of *Conferva fracta*, &c.

Fig. 384. SPERMOSIRA HARVEYANA.

Colour. Brilliant green.

Substance. Membranaceous ; scarcely gelatinous.

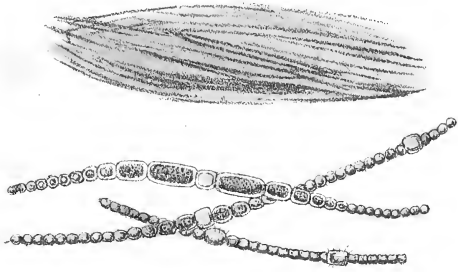
Character of Frond. A fleecy layer of slender, much curled and twisted threads (*filaments*) ; unbranched ; tubular ; containing green colour-cells nearly as long as broad ; a longer, squarish, pale reddish one (called a connecting cell) intermixed here and there. At maturity, some of the colour-cells run together, forming larger ones (a microscopic object).

Measurement. Fleecy layers $\frac{1}{2}$ inch long ; filaments rather finer than human hair.

Fructification. Minute seeds (*zoospores*) formed in the enlarged colour-cells, which are then exactly globose, almost twice the width of the common cells, and a fine chestnut brown.

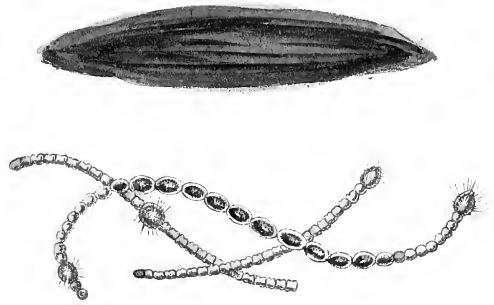
Habitat. Muddy, brackish ditches at Shirehampton. Found with *Sphærozyga Broomei*.

379.



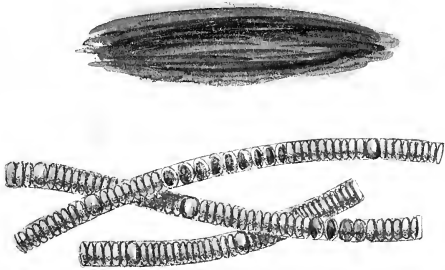
Sphaerozyga Carmichaelii, Harv.

380.



Sphaerozyga Thwaitesii, Harv.

381.



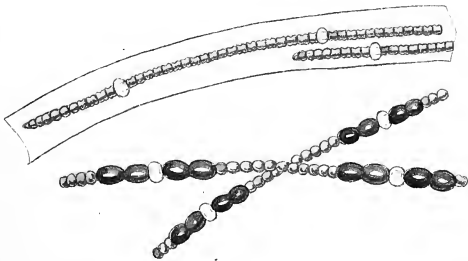
Spermosira litorea, Kütz.

382.



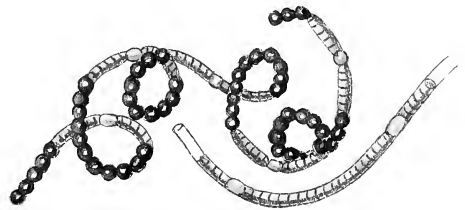
Sphaerozyga Broomei, Thw.

383.



Sphaerozyga Berkeleyana, Thw.

384.



Spermosira Harveyana, Thw.

APPENDIX OF NEW SPECIES

DISCOVERED SINCE THE PUBLICATION OF THE "PHYCOLOGIA
BRITANNICA."

OLIVE GROUP.

FAMILY II. SPOROCHNACEÆ.

DESMARESTIA DRESNAIL.

Colour. Pale fawn-brown, becoming a pleasant olive-green when dry.

Substance. Firmly membranaceous; somewhat horny when fresh; never becoming very soft.

Character of Frond. Flat, leaf-like, with an evident but thin midrib throughout, and side veins; margins slightly indented. When perfect, oppositely *branched* (if the phrase be allowed) with leaf-like fronds of the same character: the whole plant consisting of leafy formations, springing from each other.

Measurement. Specimen in Trinity College Herbarium (Dublin), 10 inches long by 2 wide. But Mr. Sawers describes others as 18 inches long, breadth 3.

Fructification. Not ascertained.

Habitat. Moville Bay, Co. Donegal, 1853. Mr. Wm. Sawers.

By Agardh, and also by Dr. Harvey, this plant is considered as only an extravagantly wide form of *D. ligulata*; but no one who has not seen intermediate specimens can easily believe this. Yet, in the tapering to both ends of the so-called *branches* of the common forms of *D. ligulata*, a tendency to leaf-like formation may be observed; the branchlets especially, resembling small ribless leaves. On the other hand, the "obscure midrib towards the base" of *D. ligulata* indicates an inclination to that formation also. Any one interested in the subject will find the growth of *Desmarestia* described in Dr. Harvey's *Nereis Boreali-Americana*, vol. i. p. 77.

FAMILY V. CHORDARIACEÆ.

LEATHESIA CRISPA.

Colour. Olive-brown.

Substance. Always firm and solid.

Character of Frond. More or less globose; forming small tubers upon the fronds of other algæ. The internal threads which compose it, densely crowded. Tubers running together in irregular patches as their growth proceeds.

Measurement. Tubers from $\frac{1}{10}$ to $\frac{1}{3}$ of an inch in diameter; patches an inch or more.

APPENDIX.

Fructification. Minute seeds (*spores*) concealed in the substance of the frond.

Habitat. Cumbræ in the Clyde. Growing on *Chondreas crispus*. April, May, and June, 1853. Mr. Roger Hennedy.

General observers may always know this plant from *Leathesia tuberiformis* (fig. 54) by its decidedly solid substance. A touch ascertains this at once. And its *tuber*-like character sufficiently distinguishes it from *L. Berkeleyi* (fig. 59). The more advanced student, who is disposed to make *durch-schnitts* of the two tuberous forms, will observe that the threads which compose the *outer-coat* (*periphery*) of *L. tuberiformis* are short and straight; whereas those of *L. crisper* are very distinctly curled, and are rather longer: nor are they as regularly and roundly bead-like in the latter as in the former. Very little difference is observable in the *spores* (which are borne among these outer-coat filaments at the base). For scientific description and figure see *Natural History Review*, 1857, "Proceedings of Societies," p. 201.

ELACHISTA GREVILLEI.

Colour. Olive, tending to brown.

Substance. Somewhat rigid.

Character of Frond. A small tuft (rising from a small tubercle); parasitic on *Cladophora rupestris*. Threads (*filaments*) slender; simple; tapering to the base; scarcely to the tips; jointed.

Measurement. From $\frac{1}{2}$ inch to $\frac{3}{4}$ long.

Fructification. Not ascertained.

Habitat. Largs: Dr. Greville, July 1852. Corrigihills, Arran: Professor Walker Arnott, the same year.

This little plant is described as "similar in many respects to *Elachista fucicola* (fig. 61), but smaller, with shorter joints and arising from a much smaller tubercle. Remarkable too for growing on one of the chlorosperm algae, whose fronds it often infests as densely as *C. fucicola* does those of the *Fuci*." For scientific description and figure see *Natural History Review*, 1857, "Proceedings of Societies," p. 201.

ELACHISTA HAYDENI.

Colour. Olive, tending to dark brown.

Substance. Soft.

Character of Frond. Minute tufts rising from a tubercle; parasitic on *Asperococcus echinatus*. Threads (*filaments*) very slender; curved; simple; not tapering to either end; jointed.

Measurement. About $\frac{1}{2}$ an inch long.

Fructification. Minute seeds (*spores*) concealed in the substance of the tubercle.

Habitat. Filey Bridge. Parasitic on *Chorda Lomentaria* and *Punctaria plantaginea*. The Rev. F. W. Hayden, 1862.

Those sufficiently interested in the *Elachistas* to examine them microscopically will be glad to be told further that the *tubercle*, whence their tufts arise, is in all cases composed of branching threads, so closely packed together as to form a compact mass. And among these branching threads nestle the *spores*, which in *E. Haydeni* are at the lower end of the threads, narrow oval in shape (narrow *ob-ovate*, i.e. the reversed egg-shape — the small end upwards), and have an abrupt cut-off appearance at top.

FAMILY VI. ECTOCARPACEÆ.

ECTOCARPUS TESSELATUS.

This plant having been alluded to under fig. 95 as raised to the dignity of a species, it is necessary to add here that Dr. Harvey does not allow its claims to any other position than that of a varied form of *E. granulatus* (fig. 95); a species very irregular in its habit of growth. Sometimes it is *alternately* branched throughout, as appears to have been the case in the plant from which the figure in *English Botany* was taken, or it is alternately branched in the larger divisions, and exactly oppositely in the lesser ones, as figured in the *Phycologia Britannica*; or the last branchlets are *secund*, *i. e.* set along one side of the *penultimate* ones, like the teeth of a comb. And this is the case with the pretty form *E. tessellatus*, first discovered by the Rev. F. W. Hayden in rock crevices on the rugged surface of Filey Bridge, at the further extremity. And as this *secund* branchletting occurs on both alternately- and oppositely-branched specimens, it would seem that these varieties of habit are of little importance.

The oppositely-branched is commonest on the south coast, and the alternate, or alternato-opposite, in the north. But they are found *conversely*. Dr. Cocks furnished fine *alternato-secund* to his *Algarum Fasciculi* from Plymouth; and *opposito-secund*, with occasional double pairs, was gathered off a buoy at Whitby this year (1862). Filey Bridge affords the three varieties.

The peculiarities of *E. tessellatus* appear to be the *secund* branchlets; a beautiful green-olive colour, and a richness and closeness of branching quite unknown in the larger forms, which often become straggling and have long portions of their stems naked. In a collection it will be well to call this plant *Ectocarpus granulatus*, *var. secundatus*—a name bestowed upon one of the *secund* forms by Lyngbye; and as Agardh unites under *E. granulatus* the oppositely-branched *latus*, the collector may, if he pleases, subdivide the three forms by separate titles. The epithet *tessellatus* is equally applicable to all, for it was suggested by the *tesselated* appearance of the fruit; but this can only be observed under a very good microscope. The Whitby specimens, before alluded to, were furnished, besides the usual fruit, with globular bodies, having the appearance of *spores* inclosed in a hyaline cell. These were seated for the most part on the stems, the *tesselated* fruit on the branchlets. It is admitted by all, that the fructification of the *Ectocarpus* is very imperfectly understood; the *tesselated* formations not having the usual characters of *spores*.

RED GROUP.

FAMILY VII. RHODOMELACEÆ.

RYTIPHLÆA OXYACANTHA.

A most delicate and lovely form discovered by Miss Turner in Jersey, in 1855, and provisionally called *R. oxyacantha* by Dr. Harvey. He is unwilling, however, to subdivide species unnecessarily, and has satisfied himself that this attractive little plant is but a slender and graceful variety of *Rytiphlaea thuyoides* (fig. 101). Its general appearance is much less stiff and formal than that of the usual *R. thuyoides*, for the branchlets, instead of being short, and rebranchleted with another set shorter still, are longer and simpler, being rarely rebranchleted at all. It seems hard not to allow so interesting a variety a special name, but almost as much difference may be observed in the stiffer or slenderer forms of *Polysiphonia parasitica* as between *R. oxyacantha* and the coarser *R. thuyoides*.

POLYSIPHONIA FŒTIDISSIMA.

Specimens under this name having been distributed in Dr. Cocks' *Algarum Fasciculi*, it is necessary to mention that Dr. Harvey does not consider it specifically distinct from *P. fibrata* (fig. 113). It is rather purpler in hue; but whether this arises from anything more than its growing on mud in a harbour, where the water cannot be so pure as on a more open sea, seems doubtful. Its professed *habitats* are the landing-places on the shore of Mount Edgcombe, and Torpoint.

DASYA PUNICEA.

Colour. Bright rosy crimson; fading to yellow and whitish.

Substance. Soft, and somewhat gelatinous; soon decomposing in fresh water.

Character of Frond. Thread-like (*filamentous*); irregularly, much branched; bushy; the principal branches widely spreading and bearing many short branchlets on each side. Stems unjointed; the older ones worn naked and smooth; the younger, throughout the plant, closely set with rings (*whorls*) of very slender, delicate, soft, jointed branchleteens. These branchleteens, $\frac{1}{2}$ of an inch long; many times forked: tapering to a point; their joints from 4 to 6 times as long as broad.

Measurement. From 2 to 3 inches long, and as much in the spread of the branches.

Fructification. Of two kinds; external. 1. Clustered *spores*, in broadly ovate *capsules*, with a short protruding mouth (*urceolate*); seated (*sessile*) on the branchlets. 2. *Tetra-spores* in lanceolate, pointed, pod-like receptacles (*stichidia*); on the branchleteens.

Habitat. Bognor, October, 1858, Mrs. Gray. Brighton, July and August, 1859, Mrs. Merrifield.

This interesting addition to the list of British Seaweeds resembles Agardh's Trieste species, *D. punicea*, so closely, that Dr. Harvey believes it may be the same, although differing in one particular character; viz. the length of the joints of the branchleteens. Those of Agardh's plant being short; of the present form, long.

DASYA CATTLOVÆ?

A form not yet described, from the fact that only one specimen, and that a barren one, has as yet been found. This unique treasure was discovered floating at very low water in St. Aubin's Bay, not far from Elizabeth Castle, Jersey, in August, 1858, by Miss Mary Cattlow. Externally, it bears some likeness to an Australian species, *D. Gunniana*; but its characters come nearest to those of the Mediterranean species, *D. punicea*, above described as having been lately found on the British shores. Dr. Harvey considers *D. Cattlovæ* more robust, however, and its branchleteens more generally distributed, and is inclined to think it may prove a distinct species.

It is mentioned here in the hope that such an announcement may induce other collectors to make diligent search for more specimens.

FAMILY IX. WRANGELIACEÆ.

NACCARIA HYPNOIDES.

Colour. Delicate rosy-red.

Substance. Very soft and gelatinous; adhering closely to paper in drying.

APPENDIX.

Character of Frond. Slender; thread-shaped (*filiform*); profusely branched; solitary or tufted. Stems wide in proportion to the branchlets; once or twice forked; set with long, wavy, horizontally-spread, opposite or alternate branches, tapering gradually upwards, and several times rebranched. Branches clothed with very slender-jointed branchlets; these furnished at every joint with rings (*whorls*) of minute, bead-like branchleteens, once or twice forked, and forming a little frill round each joint. Structure, an internal-jointed tube, covered by a streaked, fibrous membrane, which, when fully developed, conceals it. The younger branches, or branchlets, therefore, where this coating is imperfectly grown, appear jointed, the older stems not. A branchlet, with its bead-like branchleteens fringing the partition lines (*dissepiments*) of every joint, is an exquisite microscopic object.

Measurement. Two or four inches long, and as much in the spread of the branches.

Fructification. Only one kind known. Tufts of naked *spores* formed in the middle part of the branchlets; swells them out; attached to the *whorled* branchleteens.

Habitat. S. Catherine's Bay, Jersey: Miss Turner and Mr. Girdlestone. Exmouth: Mrs. Gulson.

To outward observation this plant is much more slender and feathery than *Naccaria Wiggii* (fig. 218); but any doubt as to which is which is solved at once by the microscope. In *N. Wiggii* the branchleteens are so slender and so gelatinous that they clothe the branchlets like a pile, and their position is difficult to discover. In *N. hypnoides*, although some of them cling to the stems whence they spring, the extremities of most are quite free, and their *whorled* position easily observed. Their more bead-like character and larger size are another mark of distinction.

FAMILY XIV. SQUAMARIEÆ.

CRUORIA PELLITA.

Colour. Dingy red.

Substance. Tough, but rather fleshy-feeling.

Character of Frond. A scab-like incrustation spreading on the surface of rocks; composed of minute densely-packed, upright-jointed threads (*filaments*), set in gelatine. Filaments robust at the base; tapering upwards; in tufted bundles below; such of them as *elongate*, spreading upwards in a repeatedly forked manner.

Measurement. The patches indefinite.

Fructification. Only one kind known. Oblong *tetraspores* (divided across into four); borne on the threads of which the frond is composed; supplying the place of a branch in one of the lower forkings.

Habitat. Sound of Jura: Professor Walker Arnott. Cumbræ: Mr. Hennedy. Miltown Malbay: Dr. Harvey. Probably in many other places. On rocks between tide-marks.

The *Cruoria pellita* of fig. 227 has been transferred to another genus, and is now *Petrocelis cruenta*. This change is owing to the position and character of the fruit. In *Petrocelis* (which, like *Cruoria*, is an incrustation composed of jointed threads) the tetraspores are formed in the (then) swollen centre cell of the threads themselves. In true *Cruoria* they are borne, as above described, on the threads of which the frond is composed: in fact, by the transformation of a branch into fruit. Scientific accounts of the *Cruorias*, accompanied by plates, were published in the *Natural History Review*, 1857, "Proceedings of Societies," p. 201.

CRUORIA ADHÆRENS.

Colour. Purplish, or discolouring olive.

Substance. Tough, but rather fleshy-feeling.

Character of Frond. A scab-like incrustation spreading on rocks and laminaria stems; composed of minute densely-packed, upright-jointed threads (*filaments*), set in gelatine. Filaments tapering to both ends; many of them quite simple; a few once or twice forked upwards.

Measurement. The patches indefinite.

Fructification. Only one kind thoroughly ascertained; though a second sort, (?) of unusual character, has been found. 1. Oblong tetraspores (divided across into four), borne on the threads of which the frond is composed; supplying the place of a branch in one of the lower forkings. 2. (?) A large pear-shaped, *green*, spore-like body, enclosed in a large transparent gelatinous case (*capsule*), terminating some of the threads.

Habitat. Kilruggan, opposite Gourock: Professor Walker Arnott. Aberdeen: Dr. Dickie. Penzance: Mr. Ralfs. Kilkee, 1844, Cushendall, Co. Antrim, 1850: Dr. Harvey. And probably in many other places. On rocks between tide-marks.

From the account of this plant, sent by Dr. Harvey to the *Natural History Review*, it would seem that if not two species, two forms of *Cruoria adherens* (?) were furnished by Dr. Arnott, from the same locality. The one with *tetraspores*, the other with the green *spore*-like bodies mentioned above. Whether to consider this latter variety, which differed little from the other, except in the smaller diameter and shorter joints of its threads, a new species, under the name of *C. Arnottii*, or to regard its singular fruit as the true *spores* of a *Cruoria*, Dr. Harvey doubted: nor can anything further be said in the matter than to call the attention of collectors to the fact of how much remains to be discovered about these odd incrustations. They form red stains on rocks and stones, as if blood had been spilt there, and can only be removed by a knife; and, of course, can only be understood by examination under the microscope.

ACTINOCOCCUS HENNEDYI.

Colour. Deep red.

Substance. Toughish, but beautifully gelatinous.

Character of Frond. Like a drop of blood; indefinite in outline; composed of minute closely-packed, upright-jointed bead-like threads (*filaments*), set in gelatine. Filaments tapering upwards; bead-like; sometimes simple, but frequently once or twice branched.

Measurement. A homœopathic globule! but sometimes several together.

Fructification. Only one kind known. Large *tetraspores*, formed by degrees in nearly all the joints of the threads, transforming them into "necklace-like strings of deep red beads." Each tetraspore divided cross-wise (*cruciate*).

Habitat. On an old root of *Laminaria digitata* at Cumbæ: Mr. Roger Hennedy, 1852. On a rock, near high-water mark: Professor Walker Arnott.

A beautiful microscopic object. For a scientific account and figure of this plant and others, see *Natural History Review* for 1857, "Proceedings of Societies," p. 201.





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