SEA MOSSES—TIME AND PLACE FOR COLLECTING.*

Most collecting on our Atlantic coast will be done during the summer and early autumn months. But I must remind those of you who live by the sea, or have it accessible at all times, that many things of the greatest beauty and interest will be missed if you do not go to the shore early. Our finest *Callithamnion C. Americanus* can be had in its rarest beauty early in March and even in February. The finest varieties of our *Rhodomela subfusca* are only to be found in the early spring months. This is true of many other plants. You will be surprised, also, to see what quantities of things you can find as late as November and December. Indeed, if you are to know these plants thoroughly, you must collect them at all seasons of the year. Then you will know when they come and when they go, and when they are in their greatest perfection. Those living and collecting on the Pacific coast are not fenced away by an icy wall, as we are on our shores during two or three months of our hard, inclement winters; so they can collect the year around. Dr. Anderson assures me that most of them are more beautiful and of more luxuriant growth during the Summer than during the Winter months. In general, there are three principal places for collecting "Sea Mosses" by the shore.

First, from the mass of material which the sea throws up upon the beaches, and leaves behind it when the tide goes out. This will be your main resource for getting the plants that grow in deep water. By many causes they will be loosened from their holdings in the depths, and will then float up to the surface and margin of the sea, and will be cast on shore. By carefully turning over these masses, which will be found along almost every sandy or pebbly beach, you will be able to get plants which could otherwise be found only by dredging in deep water. And, by careful search, too, among this material you will find all the deep water forms.

Second, upon the rocks and in the tide pools when the tide is out.

You can collect living plants in their native homes here only. Of course, no Algæ grow upon the sandy beaches. You must, therefore, seek all such as grow between the tide-marks upon rocky shores. Put on a pair of stout rubber boots, and go two or three hours before low tide, and search in every place, following the tide down to its farthest retreat. Many of the best things are found close down by low water mark, and some a little below that. These latter can be got best by taking advantage of the extreme low run of tide which comes about "new" and "full moon." The advantage of going before low tide and following the retreating water down is that you are not so apt to get a drenching, by the unexpected advance of a great wave, as when the tide is coming in; for, if you are close by the water's edge when the tide is rising, busily intent upon getting your floral treasures, you will very likely find yourself soaked with brine, for

> "The breaking waves dash high
> On a stern and rock-bound coast."

In hunting through the tidal region for plants, hunt everywhere, and collect everything found growing, and when collected, like Captain Cuttle, "make a note of it." If you cannot remember without, carry a small memorandum book and enter in it the habitat of each particular kind as you collect it. The tide pools, that is, the little basins in the rocks out of which the water is never emptied, are the places where the choicest collecting may be had. And the nearer they are to the low tide limits the more likely they will be to have abundance of vegetable life in them. But do not fail to look, also, under the overhanging curtain of "Rockweed" which shadows the perpendicular sides of the cliffs and great boulders. You will often find some beautiful plants there, as, for instance, the *Ptilota elegans*, the *Cladophora rupestris* and other smaller "mosses."

Third, by standing on some low, projecting reef, by the side of which the tide currents rush in and out, you will see many of the more delicate, deep water forms, all spread out beautifully and displayed in all their native grace, carried past, back and forth, in the water. Many of these, like the *Polysiphoniæ*, are seldom thrown on shore in good condition, or if they are, do not long remain so. This, therefore, is by far the best place to take many of these plants. To do this you must be provided with some simple instrument for reaching down into the water, and seize them as they go floating by. I have found nothing more convenient for this than a wire skimmer, which can be got at any house-furnishing tin shop, tied with a stout string to a light, strong stick, five or six feet long. The water passes through the meshes of this with little resistance, but the Alga, with its delicate branches thrown out widely in every direction, is very readily caught by it. It will also serve to a limited extent as an implement for detaching plants from their holdings which grow in deep tide pools, or in the sea, not too far below low water mark. For the rest of your

COLLECTING APPARATUS

you may have as little or as much as is convenient. A simple basket or box, with a few newspapers in it to wrap up and keep somewhat separate the different sorts of your collectings, will do very well. If it is convenient, have a case made with a half-dozen or less wide-mouthed bottles set in it, each provided with a cork. The case should also have a compartment for storing coarse plants, newspapers, paper bags, or whatever you may use for keeping different species, or the plants from different localities separate. Then, as your plants are collected, they may be roughly sorted and put in different bottles. But two or three bottles should be reserved for the most delicate and fragile forms. And as there are several of them which rapidly perish on being exposed to the air, the bottles should be kept partly filled with sea-water. The more delicate *Polysiphonias*, the *Calithamnions*, *Dasyas*, and some others, will need this protection. I have found a quart fruit-jar very handy. I get the kind that I can fasten a string around the neck, so as to carry it suspended in one hand, which leaves the other always free to gather in the plants with. A jar, whose cover goes on and off with the least possible trouble, is the one to be selected. The only disadvantage in using a receptacle of this sort for your collection is that in climbing over the wet and mossy rocks, your feet may chance to slip, and you get a tumble; then, in your efforts to save yourself, you will forget all about your fragile glass jar, and will smash it into a thousand pieces, upon the hard stones, and perhaps lose your whole collection. But two or three of these jars carefully packed in a basket, so as not to be easily broken, would perhaps, furnish as handy a collecting apparatus as you could extemporize at the sea shore.

MOUNTING AND PRESERVING.

For "floating out" your "Sea Mosses," as it is called, you should have a pair of pliers, a pair of scissors, a stick like a common cedar "pen stalk," with a needle driven into the end of it, or, in lack of that, any stick carefully sharpened; two or three large, white dishes, like "wash bowls," botanists drying paper, or common blotting-paper, pieces of cotton cloth, old cotton is the best; and the necessary cards or paper for mounting the plants on.

You will use the pliers in handling your plants in the water. The scissors you will need for trimming off the superfluous branches of plants which are too bushy to look well, when spread upon the paper, and to cut away parasites. The needle should be driven point first, a considerable distance into the stick, so as to make it firm, and

* From *Sea Mosses*—by A. B. HERVEY—S. E. Cassino, Boston.

allow you to use the blunt end of it in arranging the finer details of your plant on the paper. For drying paper, of course, you can use common newspapers, by putting many thicknesses together; and a great many, no doubt, will do that. But sheets of blotting paper will be found much more satisfactory; twenty-five of them cut into quarters would probably be all you would use, and those you could easily take in your trunks. What will be found cheaper and still more serviceable, if you are going to mount a large number of plants at once, is a quantity of botanist's "drying paper." It can be had of the "Naturalists' Agency," 32 Hawley street, Boston, Mass., for, I believe, $1.25 per 100 sheets; probably also of other sellers of Naturalists' supplies in all the large cities on both sides of the continent. It is a coarse, spongy, brown felt paper, cut into sheets 12 × 18 inches, and has a fine capacity for absorbing moisture. For convenience, the cotton cloths should be made the same size as the drying paper used. Some collectors, who do not care to mount a great number of specimens at once, but want to have them very smooth and fine, when dry, use no drying paper at all, but in the place of it, have thin smooth pieces of deal, got out a foot or so square and one-quarter or one-third of an inch thick; upon these they spread one or more layers of cotton and lay the plant on them and put as many more over it; the cotton absorbs the moisture and the boards keep the pressure even and the papers and the plants straight and smooth throughout. For "mounting paper" each one must use his own taste. Many prefer cards cut of uniform size; they can be had at almost any paper store or job printing office made to order. Four and a half by six and a half inches, is a neat and convenient size. But if you want to mount several hundred or several thousand spceimens, in the course of a season, so as to have some to give to your friends, and to make up a number of books or albums, to sell at Church or Charity fairs, then perhaps the expense will be an item worth considering. In that case you will find it cheaper to buy a few quires of good 26 or 28 pound demy paper, unruled of course. The paper is in unfolded sheets 16 x 21 and will cut into convenient sizes for mounting any plants ordinarily collected. By halving it you have sheets 8 x 21, or 10½ x 16 inches. By quartering, the sheets are 8 x 10½ inches; halving these you get an octavo sheet 5¼ x 8 inches, which is quite large enough for the majority of plants. One half of this will give a sheet 4 x 5¼ inches which will be the size most used; while the smallest plants look best on the half of these sheets, 2½ x 4 inches.

With your large white dishes filled near to the brim with sea water, or, if you are away from the ocean with water made artificially salt, take a few of your plants from the collecting case, and put them in one of the dishes. Here, handling them with your pliers, shake them out and clean them of any adhering sand or shells, trim away parasites and superfluous branches and generally make them ready for "floating out." Thence, transfer them to the other dish. Then take your card or your paper, selecting a piece large enough to give the plant ample room, and leave a margin of white all around, and having dipped it in the water put it quite under the floating plant, holding the paper with your left hand and managing it with your right. Now float the plant out over the paper and draw the root or the base of it up near the end of the paper next your hand, so that you can hold it down on the paper with the thumb of the left hand, the rest of the hand being under the paper in the water. Now, slowly lift the paper up to the surface and draw it out of the water in such a way that the water will flow off from it in two or three directions. This will spread the plant out somewhat evenly over the paper. But in many cases you will need to arrange the plants in their most natural and graceful position, and also take care that they do not get massed upon each other, and make unsightly heaps while others are left bare. They should be carefully arranged so as to make the most beautiful picture possible. In some fine and delicate plants, too much care cannot be bestowed, in having the remote branchlets all naturally disposed and spread out. This final work of arranging details, you will do with your needle while you hold the paper very near to the surface of the water with your left hand, so near, indeed, that there will be just water enough, and no more, above it to float the delicate parts which you are manipulating. Oftentimes it will be found convenient, after the paper with the plant on it has been removed from the water, to re-immerse a part of it at a time and re-arrange the several parts separately. But all this can easily be done, more easily than I can tell how to do it. A very little practice will give you the "knack" perfectly. And, indeed, these plants are by no means refractory, or hard to manage. They will do anything you can reasonably want them to, while you humor them by keeping them in their native element. In fact, you will commonly need to do no more with them, than to just help them to do what they are willing and disposed to do themselves. For if you will let them take on your paper the form and outline which they have by nature in the water, there will be nothing left to desire, for their color, form and movement all combine there to make them the loveliest and most graceful things that grow. When you have put the last finishing touches upon the "floating" process and your "Sea Moss" is adjusted on your paper so as to be "a thing of beauty and a joy forever," then you want to lay the paper upon some inclined surface—any smooth board will do—to drain away the superfluous water. Thence it is to be transferred, in a few moments, to the press, for drying.

This is made in the following manner: Laying down one of the above described sheets of blotting paper, botanists' "drying paper" or boards of muslin-covered deal, you lay your paper with the plant on it upon this, the plant up. Cover the board or drying paper all over with "floated" specimens in the same way. Over all, and lying directly upon the plants spread your piece of muslin. Upon this put another sheet of the paper, or board, and upon this again a layer of plants, then a piece of the muslin, more paper, plants, muslin, and so on until you have disposed of all your collection, or so much of it as you care to mount. Upon the last layer of plants put a final sheet of paper, and over all a stout board as large as the drying paper. Upon this lay some heavy weights—stones will be as handy as anything at the seaside. I should put on, I think, about fifty pounds of them if I were using botanist's drying paper, which has a good deal of give in it. With the use of boards, unless there are a good many thicknesses of muslin, it would not do to weight it so heavily, or some of the plants would be crushed beyond recognition. I use the drying paper and always have two boards, one for the bottom and one for the top of my press. Then when I have made the pile complete, I can put it aside in some convenient corner out of the way, and set the stones to work bearing down upon it, a business for which they seem to have some conspicuous and weighty gifts.

Some botanists recommend that the drying paper be removed in the course of five or six hours, and the cloths and papers again in twenty-four hours. This will, perhaps, be the best if anyone has plenty of time. But my practice has always been to let them lie twenty-four hours and then give them a change of both cloths and papers, being careful in removing the cloths so as not to lift the plants from the mounting paper.

The second time in the press they should be subject to a harder pressure, seventy-five or one hundred pounds of stone being not too much. In twenty-four hours more most of them will be quite dry and ready to be put into your herbarium, album, or whatever you use for the final disposition of them. Those that are not perfectly dry should be put back in the press with dry papers and cloths for another day's stay.

When the plant is perfectly dry and removed from the press you should, before putting it away and forgetting these facts, write on the back of the paper the exact date and place of collecting.

People often ask me what I use to make the plants stick so firmly to the paper, supposing, evidently, that it is necessary to have some kind of gum or mucilage for that purpose. I have to answer that I have for most of them to use nothing whatever; that there is sufficient gelatinous matter in the body of the plant to make it perfectly adhere to the paper without other aid. And the reason for putting the muslin over the plants in the process of pressing and drying is, that they may not stick to the drying paper which is above them, the muslin not adhering to the plants at all except in some few cases.

But a considerable number of "Sea Mosses" do not adhere to paper well. They either have not gelatinous matter enough in them or will not give it out to glue their bodies to the paper. Various devices are resorted to in these cases. Sometimes the plant, after being dried in the press in the usual way, is simply strapped down with slips of gummed paper. Sometimes they are fastened down with some kind of adhesive substance, after being dried, gum tragacanth being the best for this. Others take them and float them out a second time in skimmed milk and after wiping off the milk from the paper, from the plants, except directly under the plants, put them in the press to dry again, when, it is said, they stay. I have never tried this method. A friend of mine who is famous for the artistic way in which she always "lays out" her "Sea Mosses" tells me that for these forms which lack what the Phrenologist might call "adhesiveness" she prepares from the "Irish Moss" *Chrondus crispus* a semi-fluid paste, into which she dips them before putting them on paper, and then carefully removes all of it from the paper and plant, except what is between the two and then put them in the press. By this means they are made to stick "like paper on the wall."

In preparing the coarser "Rockweed" and "Kelp" for the herbarium, another method will have to be persued. These will almost all turn very dark, or quite black, in the process of drying. I am accustomed to treat them by the following method: Taking them home, I spread them out in some shady place and let them lie for a few hours, perhaps twenty-four, perhaps less or more, until most of the water in them has evaporated, but not till they have become hard, stiff and brittle. Then I put them between sheets of drying paper and lay them in the press, and keep them there until the process of drying is complete. A little practice will be the only way by which you will be able to tell if they have been dried long enough in the open air. If you find them inclined to mould while kept in the press, you may be sure they are not dry enough, throw them away and get some new ones.

It is sometimes desirable to keep the treasures we have gathered from the sea unmounted, that we may carry them away to await a more convenient season for floating them out, or that we may send them to some friend or correspondent on the other side of the continent, or beyond the seas. It is, therefore, fortunate that all but the more delicate and perishable of these plants, may be dried rough, rolled up and kept any length of time, transported around the world, and then, when put in water again, will come out in half an hour, as fresh and bright and supple and graceful as they were when taken from their briny home. The friend just referred to assured me that even the *Callithamnia*, *Dasyæ* and the most delicate *Polysiphoniæ*, and such like plants, may be so treated by first shaking the water out of them, and then thoroughly mingling them with dry seasand, and drying them rough in the usual way. She says the sand will adhere to the most delicate fibres and ramuli of the plant in such a way as to keep them separate and prevent their getting glued together, then, when they are afterwards soaked out, the sand will be disengaged, and the plant will be left as good as ever it was. Perhaps I ought to suggest that "soaking out" should always be done with salt water, unless you know you have only those plants which fresh water will not hurt. When I have had specimens of the "Rockweed," or "Kelp," sent to me "rough dried," I have found it best to prepare them for mounting, not by immersing them in water, and so get a great quantity of moisture into them, which would have to be expelled afterwards, with no little trouble, but by wrapping them about with wet towels; from these they would imbibe enough dampness to be manageable, and not enough to make them troublesome.

Before taking leave of this part of my subject I must permit myself to add a word to a point which botanists commonly think too little about, viz., the display of taste in the mounting of their plants. To the mere botanist a plant is a *specimen* of a given genus and species, interesting only for that fact. If it is a full grown typical form with fruit, all the better. Now, all are not botanists. Most of those who will read these pages will have an interest in these plants, to which the scientific interest will be secondary. I want to say then to them, look for the best things; get the whole plant when you can, but get and preserve the most perfect and beautiful plants. It is the rule with botanists to put but one species on each paper or card. I certainly advise disregarding this rule, unless you are mounting for scientific purposes altogether or chiefly. With numberless shades of red, which one group of "Sea Mosses" will give you, with the various kinds of green the other two will present, you will have an opportunity to display all the taste and skill you are master of. For in combining several different colors and forms on the same paper you may often produce the most brilliant results. A little practice will soon make you able to handle two or three plants at the same time in "floating them out" almost as readily as you can manage one. Then, again, you will find it possible with some of the more slender plants to work interesting and beautiful "designs" in the same way. Initial letters, even monograms, may not be beyond your reach with a little care and practice. Let the "Sea Mosses" contribute to the cultivation of every faculty and all possible means of pleasure for you.

For preserving your treasures after they are neatly mounted, pressed and dried, you have two courses open to you. You can take care of them as the botanist does by arranging them systematically in a herbarium, with covers of stout manilla paper, folded 10½ x 16 inches for each genus, and the species separated by white sheets of thinner cover, or you can provide yourself with blank books, made for the purpose, having the leaves cut to fit the sizes of paper or card which you mount your plants on, so as to slip the corners of the cards into the cuts. It is well in that case to provide a book with leaves large enough to hold two or four cards each. By following the directions here given I cannot doubt you will soon become a successful collector, and an expert in mounting and preserving "Sea Mosses."

ACCORDING to M. Chappuis (*Bull. Soc. Chim.*) the phosphorescence of phosphorus vapor by ozone. Phosphorus is not luminous in pure oxygen at 15°, and at the ordinary pressure, introduction of a trace of ozone causes luminosity; those substances which hinder the luminosity of phosphorus, *e. g.* turpentine oil, are substances which destroy ozone. If a little turpentine oil is brought along with phosphorus into a tube containing pure oxygen, and a small quantity of ozone is then passed in, the phosphorus exhibits its luminosity for a few moments only; M. Chappuis supposes that this is due to the combustion of phosphorus vapor by the ozone, and that the transiency of the phenomenon is explained by the rapid removal of the ozone by the turpentine oil.