

XVII. SOME DIRECTIONS AND SUGGESTIONS FOR COLLECTING THE SPHÆRIIDÆ AND AQUATIC GASTROPODS.

BY VICTOR STERKI, M.D.

The Sphæriidæ, our smallest fresh-water Pelecypoda, or bivalves (mussels), are very interesting objects of study. They have been somewhat neglected on account of their generally small size and the apparent difficulty of securing them. They are also somewhat difficult to identify, principally because of the considerable variation which reveals itself among them. At present there are over two hundred species and varieties known from North America, belonging to the genera *Sphærium*, *Musculium*, *Eupera*, and *Pisidium*. Their many varieties and forms make them all the more interesting, because of the questions which they raise as to systematic arrangement and distribution. The largest are about 20 mm. long (*Sphærium sulcatum*); the smallest 1.5-2 mm. (*Pisidium punctatum*, and some others).

They are approximately well-known from only some small parts of the continent. Few places have been systematically and thoroughly searched, and there are stretches of hundreds and thousands of square miles where only a little sporadic collecting has been done, and equally large areas in which no collections at all have been made. There are therefore chances almost anywhere to secure valuable material for a collection and at the same time to aid the specialist in studying them. The same, to a large extent, may be said of the aquatic gastropods, or snails. They are generally associated, and the methods of collecting them are essentially the same.

WHERE FOUND.

They live in waters of all kinds, and no place should be neglected, or overlooked, especially since different species and forms are found in different habitats. Lakes, ponds, rivers, and sloughs, canals, ditches, springs, and even the smallest rills, sink-holes, swamps, and marshes, even miry puddles, all yield some of these mollusks. Waters

full of aquatic plants, estuaries, drainage-ditches, etc., are especially rich in mollusks. Some of the smallest and rarest *Pisidia* live among gravel in rivers and creeks. Tidal waters are often rich. In a small tidal ditch in Virginia large numbers of specimens of about thirty-five species of mollusks were collected in less than two hours, and about a dozen of them were Sphæriidæ. Brackish waters should be searched over carefully and may yield peculiar forms.

Many species and forms are often found abundantly in the mountains, even at altitudes of 10,000 to 12,000 feet above sea-level, and quite a number of species have been collected within the Arctic Circle. Some apparently promising places may be poor, yet yield interesting forms; others are immensely rich. In some instances over twenty thousand specimens of *Pisidium* alone have been taken from a single locality in a short time, representing many species, some of them common, others very scarce. All this shows that collecting should be done *thoroughly* at every available place, so as to secure large numbers of specimens, and all species inhabiting that place so far as possible.

Some Sphæriidæ are able to live and propagate in damp places, under and between dead leaves, in muck, where water abounds only in spring, or after heavy rains; and such forms are able even to survive severe droughts lasting weeks and months, as for instance *Sphærium occidentale*, usually found in company with certain aquatic snails. Some *Pisidia* may be found among moss in damp or wet places and around springs.

It is worthy of note that different regions have their peculiar forms differing from each other. The molluscan fauna of the Pacific States differs materially from that of the Atlantic States, and the fauna of the South from that of the North.

COLLECTING OUTFIT.

Some of the larger mussels and snails may be found and picked up singly, but in general they must be collected "wholesale." Various kinds of perforated metal and wire strainers have been used, some of them ingeniously constructed, but they are not satisfactory. The best and the simplest thing is a net, somewhat like a butterfly-net. A piece of strong wire, $3/16$ in. in diameter, and about four feet long, is bent so as to form a ring of six to eight inches in diameter; the ends, or shanks, are crossed over each other, and the longer end is bent

back over the shorter (*see cut*); this may serve for a handle, but it is better to fasten it to a wooden handle, about three feet long, *e. g.*, a broomstick, planed down somewhat at one end to the length of

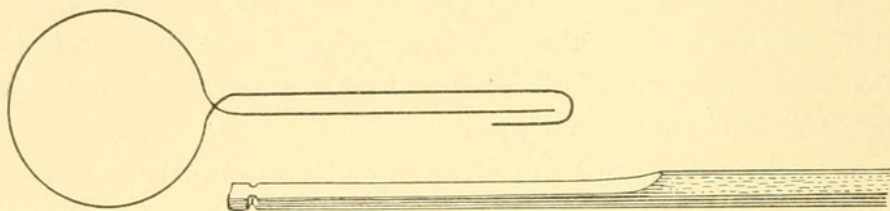


FIG. 1. Method of making a cheap ring for a collecting net.

the wire handle, and with a groove around it, about half-an-inch from the end. The wire frame can be tied to the handle with stout twine. To the wire ring is fastened a sack-net, twelve to fifteen inches long, of good, somewhat loose, burlap, which is the best and cheapest material, and procurable almost anywhere. The seams must be sewn well, best doubly, with good linen thread, and the rim over the wire should be protected by a strip of strong canvas, to prevent its being worn through in a short time. Such a net, or two of them, take little space, and a stick for a handle may be found and fitted anywhere. Some small muslin sacks should be taken along, a piece or two of muslin about a yard square, and some small boxes and vials, and, for a longer trip, a bottle with a few ounces of alcohol. This is almost everything needed for good work. High rubber boots are desirable, even necessary. Besides, it is recommended to take a small hoe (Ferriss' hoe) along. It is handy in many ways, especially for collecting land-snails. The hoe and the net with its handle, tied together, are not very cumbersome.

COLLECTING.

As stated before, some snails and mussels may be picked up with the hand. Many of the former are seen clinging on rocks, stones, or wood. Some *Musculia* may be found on pieces of wood covered with mosses and algæ; they must be taken up carefully lest their thin and fragile shells be crushed. Special care is needed in collecting the small and tender, flat-shelled species of *Ancylus* and *Gundlachia*. They are found on plants such as the stalks and leaves ("pads") of water-lilies, the leaves of *Typha*, *Sparganium*, *Sagittaria*, etc.; also on dead and living shells, stones, etc. The best way is to take them

up with a knife-blade, or to cut off pieces of the plants with the snails on them.

With the net the surface-layer of the bottom in pools and streams is carefully scooped or scraped up, and when a good quantity is gathered the net is shaken in the water, dipped repeatedly to the rim, and worked with the hand to wash out mud and fine sand. Of the coarser material, plants, debris, etc., handful after handful is taken from the top, while the net is held in the water to near its rim, washed, shaken, then looked over and thrown away. The remaining finer material, generally a small quantity, with the mollusks, is then put into some receptacle, best a muslin sack. Haul after haul is made from a place, and then a label is added to the "washings," noting the place, its nature, and the date.

Where there are thick, tangled masses of plants, like *Potamogeton*, *Ceratophyllum*, *Philotria*, *Vallisneria*, etc., along the shores of ponds, small lakes, or bays, the plants may be pulled out with a rake, slowly and carefully, put into a wash-tub, if within reach, and washed out there. After a number of hauls the water is poured off and the settlings are put in the net to be washed free from mud and fine sand. A large sack mounted on a wire ring or hoop and supported by a few forked sticks, hanging in the water, is also serviceable and more easily carried along than a tub. Even a hole dug in the ground at the water's edge will answer the purpose. After a place has been raked over the net may be used to gather what has dropped to the bottom.

At similar places away from shore collecting is done from a boat or launch. The net is driven and swung through the masses of plants and over the bottom, where it can be reached. Good results may be obtained in this way; but, where there is an old accumulation of muck, mollusks are generally scarce. Where a spring or brook enters a lake or pond the harvest will usually be rich, and such places may be more easily accessible from a boat than by wading out from the shore.

For collecting in water about four to eight feet deep the net may be tied to a long pole; a dredge is preferable, but cannot be used where the bottom is obstructed by plants, pieces of wood, etc. In deeper water dredging is the only means for collecting, and should be used more extensively. A small dredge can easily be made of a metal frame two to three feet long and about one foot wide, or larger, with a burlap sack attached, preferably protected by outer flaps of leather

or strong canvas, twill, or jean. The "Holland dredge" (*cf.* Memoirs Carnegie Museum, Vol. IV, p. 281) modified, with a small wheel on each side of the frame, will prove very serviceable.

A good deal of dredging has been done in European lakes, and many deep-water species, or forms, especially of *Pisidium*, have been brought up in this way. It is time that we explore our lakes, especially the Great Lakes. To judge from what has been secured by some dredging in Lake Michigan good results may be expected. Some deep water mollusks have also been taken from the stomachs of white-fish, and it seems worth while to follow that trail.

From dead leaves, moss, etc., specimens may be picked out, or a portion of such material may be taken along; or better still, if water is near, carried to it and its contents washed out. Such material may also be dried and then its contents secured by sifting.

On gravelly bottoms of rivers and creeks, where the net cannot be directly used, there are other methods of procedure. Where there is a strong current in shallow water, as on bars and riffles, a hole a foot or two deep may be dug out; above it some furrows converging and leading into it are made. Then the gravel upstream over a wide stretch should be well stirred and the current will carry the smaller and lighter particles down. From the hole the material thus gathered is then taken out with the net and washed. If there is anybody to help, the net can be held in the lower furrow to take up what the current carries along. In this way large numbers of specimens not otherwise obtainable can be secured, often representing rare species, *e. g.*, *Pisidium cruciatum* (2 mm. long), also various small gastropods and very young Naiades. By the way, the same method may be used for collecting certain crustacea, insects, etc.

When the water in rivers is quite low, there may be isolated pools and waterholes along the shore where mollusks are aggregated in great numbers, principally snails. There they sometimes can be gathered by the quart. Not only a good supply of the larger forms should be taken along, but the net should be used to secure the smaller and minuter specimens.

SEASONS.

Collecting may be done at any time of the year, even in mid-winter, and good things have even been secured with the net through holes cut in the ice. For obvious reasons, most may be accomplished in

late summer and fall. It is desirable that accessible places be visited at various seasons, especially for *Musculium*, of which at least a large part become full-grown, and then die in early summer to midsummer, the time when also most of the *Lymnæa*, *Planorbis*, *Physa*, etc., attain maturity. A large percentage of *Musculia* now in collections are immature, and it appears that of some forms only young and half-grown specimens are known. In some instances observations have been made and series of specimens at successive stages of growth were secured by collecting at the same places every few weeks from spring to midsummer, or fall. It will also be interesting to compare observations made in this respect in the North and in the South.

DRIFT.

Fine drift on the shores and beaches of lakes, accumulated in heaps and rows, or thinly scattered, almost always contains shells. Though generally more or less bleached and waterworn they are well worth taking. From drift-heaps good quantities should be taken along. Scattered specimens on the beach may be swept on to a piece of cardboard or tin with a feather.

Drift accumulated along rivers, creeks, or ravines after floods and heavy rains, from a handful or less to large heaps, are always worth taking. A sieve, if at hand, will help in separating the coarser material from the finer. Most of the shells it contains are generally of small land-snails, often thousands of them, but some aquatic mollusks are usually also found.

FOSSILS.

Fossil specimens should be collected wherever possible from the fresh-water deposits of the Tertiaries and older formations, from which very few so far are extant. Valuable material should be found especially in the Western States. It is barely necessary to say that they should be handled very carefully, since the shells are thin and fragile, and that not only the locality should be noted, but also the formation and stratum.

Marl deposits, in a number of states, have been more or less explored, and many of them are wonderfully rich in shells of the Sphæriidæ and Gastropods. Generally the marl is so soft that the shells can be washed out of it with proper care, and thus it is possible to take good quantities along to be worked up at home.

WORKING UP.

The "washings" brought home, or to camp, should be looked over as soon as convenient, especially in hot weather, and spread out for preliminary drying, preferably on a sheet of muslin. Larger *Sphæria* and *Musculia* may be picked out at once, cleaned if necessary, and put into alcohol diluted with from 75 to 60 per cent. of water for a day or two. After that such as are wanted for future examination of the soft parts are put in somewhat stronger alcohol. The others can be easily dried, while with fresh ones there is danger of putrefaction. Using alcohol is preferable to scalding in hot water, then removing the soft parts and closing the shells with mucilage or glue. Even drying without alcohol is better if there is a chance for doing so. Larger snails wanted for anatomical examination are also put in alcohol or some other preserving fluid; the others may be treated in the usual way, by scalding and extracting the soft parts, which again may be preserved by themselves, in which case they require exact labeling. The opercula of operculate snails, such as *Viviparidæ*, etc., should be kept either with their soft parts or the shells, but not glued into the apertures.

When the washings are somewhat dry, so that they can be crumbled up, the specimens may be picked out and then put to final drying. It is difficult or impossible to find the smallest mussels and snails in damp clogging debris, and takes much more time. Generally it is preferable to dry the washings thoroughly, and then they may be kept for being worked up at some convenient time, but never without the label indicating the place and date at which the material was taken. Larger *Sphæriidæ* and snails, if not treated with alcohol, require a day or two to become quite dry, in moderate heat; too great heat will brown them and crack the shells of *Musculium*.

After a season's collecting, or even after an extended trip, there may be a large number of lots of washings, siftings, drift, etc., on hand, and it is desirable to have on each parcel a conspicuous outside label denoting its origin.

If there is a good portion of washings, or drift, a sieve is a great help for separating finer from coarser material, and two, of different meshes, may be preferable. If not provided with sieves, shaking to and fro on a piece of paper or cardboard is the next best method of treatment. Material may be spread on a table and the specimens

picked out with a fine pair of pincers. A number of small boxes or trays should be kept on hand for different species, or at least genera or groups, and thus time and work will be saved. Even the smallest specimens should be taken. Valuable material has been thrown away on the supposition that the specimens were "only young and of no account." Even the young are desirable, and so to some extent are *dead* shells. *Musculia*, to repeat, must be handled carefully, because many of them have very thin and fragile shells. *Pisidia* in particular are frequently incrustated with a ferruginous deposit, sometimes so thick that they appear to be globules of dirt, and it takes a trained eye to recognize them. While fresh and living they can be cleaned by putting them in a vial with some clean, sharp sand and a little water, and shaking vigorously. A single specimen, fresh or dry, with not too thin a shell, can be cleaned by rolling between moistened thumb and finger, with some sand; a small glass with water and another with sand, side by side on the table, have proved useful.

When the specimens are picked out, separated, and identified so far as can be done, they are put up in vials rather than in boxes, except in the case of large lots, labeled, with or without the name, but with the place of origin, catalogued, and filed in the collection. If the label is not in the container, a small slip of paper should be added with the serial entry number of the label, to prevent misplacing. On larger specimens in the collection the number should be written.

The beginner will have some difficulty in identifying his specimens, and even the more advanced student may be in the same position with respect to some groups, *e. g.*, the *Sphæriidæ*. The best way is to send them to an expert or specialist; it will at the same time aid the latter in his studies.

SENDING SPECIMENS FOR IDENTIFICATION.

When specimens are sent for examination it is best to leave those of a genus or group from each locality mixed up, only separated for gross differences of size. This often makes the work easier, and gives an opportunity for studying the species and the extent of their variation, also the influence of the habitat. It goes without saying that separated lots may be sent for identification or verification, and it is recommended that all specimens of a lot be sent; very often a few have been forwarded with the request to name them, while the balance was kept, on the supposition that they were all of the same kind, and to be proved later a mixture of several species.

The labels should indicate not only the localities, but also some notes on the nature of the habitat, just as in the collection. Labels saying "Buffalo, N. Y.," or "Snark County, Kansas," are sadly inadequate. It is also a great help if the labels or numbers are placed conspicuously. If the labels cannot be placed with the specimens, number-slips are put in, corresponding with the numbers on a list sent along. Specimens packed in a vial or box, not filling it, should be protected from jarring by adding a loose wad of cotton; but care should be taken in the case of *Musculia* not to stuff the cotton in so tightly as to crush the specimens. Shells not perfectly dry should never come in contact with cotton. The fibers stick to them and are difficult to remove. When necessary to fill out or pad a vial a small piece of sponge is serviceable.

Whole washings, "dirt and all," may be sent and will be welcome, either dried or fresh, if the weather is not too hot, or the distance not too great. But materials not thoroughly dry should not be in tight containers, such as tin boxes or cans. Drift and siftings will also be gladly received. The specimens will be separated, named, and returned. Where they are in sufficient numbers some specimens will be kept for records and for further study and comparison.

NEW PHILADELPHIA, OHIO,

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