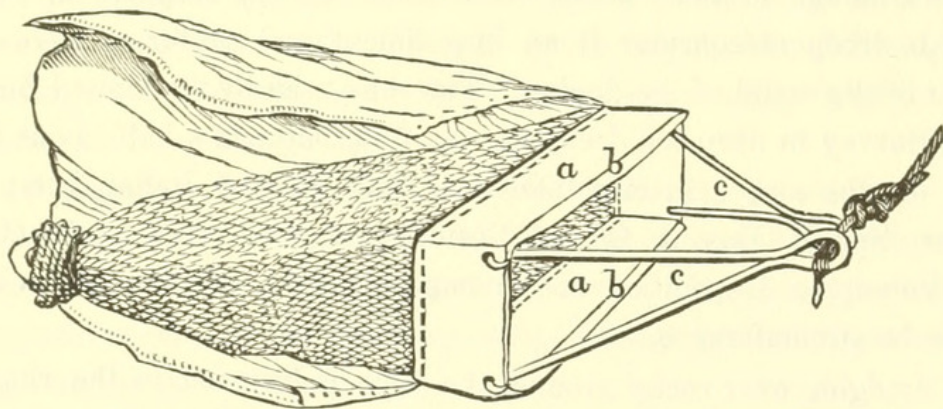


No. 4. — *Directions for Dredging.* Drawn up by L. F. DE  
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THE results obtained in late years by dredging in various depths have been such as to open a wide field to the naturalist. The laborers are few as yet, and these directions are issued in the hope of increasing their number by making them acquainted with the readiest modes of operation.

The dredge has as yet received but few improvements since the days of Forbes. His model has proved simple and sufficient, and would probably gain little by being made more complicated. Its construction will be best understood by referring to the figure below, in which *a a* represents an iron frame with the edges *b b* sharpened and slightly turned up, and forming the scrapers. The rear edge is pierced with a row of holes, through which the twine, or, better, brass wire, is passed by which the net is fastened. The arms *c c* are hooked to the short sides of the



frame, in such a way as to allow their being folded in, for easier transportation, and turned out in case they are caught among the rocks, as will be explained further on. The net is made of strong twine with small meshes, and may be three or four feet deep, according to the size of the dredge. It was found convenient to have it open at the bottom, and gathered and firmly tied only when in use. This gives greater convenience in emptying and washing out the bag after a haul. The net is protected against the rocks and corals by an outer covering of stout canvas or leather, open at the bottom. It is represented cut



open and thrown back in the figure, so as to show the net. The English Deep-Sea Dredging Expedition used a double bag, the outer being a close net of sounding-line, the inner a piece of "bread-bag," a somewhat open canvas. To prevent the bag from being turned inside out in going down, a stout brass wire, bent in a semicircle and put inside the bag with the ends fastened to the frame, will be found very convenient.

The dredge used by the Swedish expeditions is a little different, the bag being simple and made of canvas with several square holes closed with wire-gauze. Light objects would seem liable to be washed out of this bag when hauling up, still it appears to have worked satisfactorily.

Mr. Bowerbank used a bag formed of two pieces of raw hide connected at the ends and bottom by a net made of cod-line.

The dimensions of a dredge vary according to the depth or bottom on which it is to be used. From two feet by six inches up to four feet by eight inches will be found the most useful dimensions. For deep-sea dredging, the dredge ought to be heavy, so as to sink rapidly, and be kept on the bottom by its own weight. A heavy lead was attached to it with advantage in the United States Coast Survey Expedition. The English dredgers consider it an impediment, and prefer to have the weight in the metal of the dredge. The rope used by the United States Coast Survey in deep-sea dredging was from one and a half to one and three fourths inches in circumference, made of best Italian hemp by Messrs. Sewall, Day, & Co., of Boston, and gave entire satisfaction. The Porcupine Expedition used hemp rope two and two and a half inches in circumference.

In dredging over rocky ground, the rope is fastened to the ring of one of the arms only, whilst the other is tied to it with spun-yarn. Should the dredge get foul of a rock, the stop will break and the dredge come up endwise, the whole pull acting then on one arm.

As a rule the length of line should be about twice the depth. On very soft bottom it is somewhat shortened, to keep the dredge from getting filled too soon. In very great depths it was found by the English Porcupine Expedition that the line could be kept much shorter by attaching to it weights of one hundred or two hundred pounds at about one fourth the depth from the dredge. The dredging is then carried on, as it were, from the weight, and not from the vessel. In



this way three thousand fathoms were used for a depth of two thousand four hundred and thirty-five fathoms.

Dredging may be carried on from a boat, down to ten or twelve fathoms, with wind enough to propel it, or a good crew to pull it if calm. From a sailing yacht two hundred and fifty fathoms have been attained, though probably with some difficulty. For greater depths a steamer is almost indispensable, provided also with a donkey-engine to haul up the line. Without the latter the labor of the men is very heavy, and the time consumed a great drawback. To ascertain the strain on the rope, some kind of a dynamometer ought to be attached to it. A convenient form is the "accumulator" used in the *Porcupine*. It consists of a number of solid india-rubber springs, about two feet long, connected at each end with a disk of wood. One end of the accumulator is fastened below to the derrick and above to a rope, which, passing through a block at the top of the derrick, supports the snatch-block through which the dredge-line goes overboard. The motions of the accumulator show the variable strain on the line.

Many valuable specimens were obtained on board the *Porcupine* by means of hempen tangles or swabs, attached to the ends of a transverse bar made fast to the dredge. According to Mr. Jeffreys, it is, however, more advisable to use them separately, as they interfere with good work of the dredge itself.

In dredging it is preferable to have the dredge go over the bow, especially on rough bottom, as it is easier, in case of fouling, to steam ahead to release the dredge than to back up. Otherwise the stern is more convenient, as the working-table, alcohol jars, &c., are usually stowed on the quarter-deck.

After the dredge is brought up the contents may be emptied into a tub, the more delicate specimens picked out and transferred to clean sea-water if they are to be observed alive, and the residue washed in graduated sieves of copper wire. A rough list of the contents is noted in a book, with specification of the depth, temperature of the water, &c. Until they can be sorted, the contents of every dredgeful can be tied up in a bag of some loose stuff (old bunting from worn signal-flags was used in the Coast Survey), a label written with ink and folded up being enclosed, and the whole put in alcohol. Thus a large metallic vessel, filled with alcohol, can be used to contain the results of many dredgings; bottles being reserved for the more delicate objects. Economy of space can thus be gained to a considerable extent.

Surface specimens can be obtained during the dredging in tow-nets of bunting, stretched over a hoop; when under way very small towing-nets may occasionally be used also, if the speed is slow.

The naturalists of the Swedish Josephine Expedition used also an implement intermediate between the dredge and the tow-net, to obtain the small swimming crustacea, found near but not on the bottom. It was a sort of very light dredge, made of hoop-iron, with the end-pieces rounded off in such a way as to lift the edge of the net some distance above the ground, so as not to scrape. The net was made of some strong gauze-like stuff.



Pourtalès, L. F. de. 1871. "Directions for dredging." *Bulletin of the Museum of Comparative Zoology at Harvard College* 2(4), 451–454.

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