

RECENT EXPLORATIONS IN THE REGIONS OF THE
GULF STREAM OFF THE EASTERN COAST OF
THE UNITED STATES BY THE U. S.
FISH-COMMISSION.*—*Sticher.*

INTRODUCTORY.

Although several extended surveys along the region of the Gulf Stream had been made by the officers of the U. S. coast-survey since 1844, no systematic dredging had been done along its course, north of Florida, until 1880. During the previous surveys, large numbers of bottom samples had been saved. Some of these were studied many years ago by Professor Bailey, and later by Mr. L. F. de Pourtales. Many of the Foraminifera and other microscopic forms have been described by them. A few small shells from the same source were described by Dr. A. A. Gould in 1862. These investigations gave a general idea of the nature of the materials of the bottom and the depth, but many errors existed in the earlier surveys in the determinations of temperature, and in many cases the recorded depths were unreliable. The extensive surveys made by the Blake, since 1880, have been conducted with much better apparatus and greater accuracy.

The real character of the fauna inhabiting the bottom beneath the Gulf Stream, off our coast, was completely unknown until 1880, when numerous and successful dredgings were made, first, by Mr. Alexander Agassiz, on the coast-survey steamer Blake (J. R. Bartlett, U. S. N., commanding), and, later in the season, by the U. S. fish-commission party, on the Fish Hawk. The Challenger, on her celebrated voyage, made a line of dredgings from Bermuda towards New York; but, on approaching our coast, she turned northward, and went to Halifax. Her station nearest to our coast was about 160 miles off New York, in 1,240 fathoms. This is much further off the coast than any of the fish-commission dredgings, and outside the Gulf Stream slope. The few dredgings made by the Challenger off Halifax were partly on the shallow fishing-banks (Le Have bank), and partly in the deep water of the Atlantic basin. By mere chance, therefore, the Challenger missed the discovery of the exceedingly rich and varied deep water fauna that is now known to occupy the Gulf Stream slope all along our coast. In 1872 one haul was made by Messrs S. I. Smith and O. Harger, on the Bache, in 430 fathoms, south of George's bank, on this slope; but it happened to be on a comparatively barren spot. In 1877 the U. S. fish-commission party dredged on the northward continuation of the slope, about 120 miles south of Halifax, in 90 and 190 fathoms; but the bottom was of barren gravel, and the results meagre and unsatisfactory. In that region the cold currents are rapid, and the slope of the bottom is exceedingly steep, making the dredging very difficult. In 1880 Mr. A. Agassiz, while on the Blake, made several lines of dredgings off our eastern coast, crossing the Gulf Stream slope. The most southern of these were off the Carolina coasts, and the most northern stations were just south of George's bank. These dredgings extended from shallow water to 1,632 fathoms. The Blake was furnished with excellent apparatus for sounding and dredging, temperature determinations, etc. The officers of the Blake secured by this exploration a large amount of reliable physical data; and Mr. Agassiz obtained very interesting collections, including large numbers of new forms of animal life, many of which have already been described in the bulletin of the Museum of comparative zoology.

Later in the season of 1880, the U. S. fish-commission dredging-party under the direction of the writer, made its first expedition to the Gulf Stream slope in the steamer Fish Hawk (Lieut. R. D. Tanner commanding). The region visited was about 75 to 80 miles south of Martha's Vineyard, in 65 to 192 fathoms. On Sept. 4, when this ground was first visited by us, a long day was spent in dredging and trawling, and with marvellous results. The bottom was found to be occupied by an exceedingly rich and abundant fauna, including great numbers of new and strange forms of animals belonging to nearly all the marine orders. Many fishes never before taken on our coast were secured. Thousands of beautiful and undescribed star-fishes of many species, with varied shaped and colors, encumbered our deck. Crabs and shrimps of strange kinds, some of them of large size, were taken by thousands. Numerous new and curious species of shells, some of them very beautiful; bushels of large and brilliantly coloured sea-anemones, several of them over a foot across, and most of them previously unknown, with sea-pens and corals of elegantly forms and colours,—were among the more conspicuous treasures secured

on that ever memorable day. So successful were we, that it required the most diligent and devoted labour on the part of our entire party,—though aided by the officers and sailors of the steamer, who shared more or less in our enthusiasm,—from daylight in the morning till late at night, to preserve what we had secured, notwithstanding we threw away many thousand of duplicates. Some idea of the richness of the fauna, and of the abundance of life on the bottom in the region, may be gathered from the fact that it required above five barrels of alcohol to preserve the portion of the catch that we saved on this one day, and a similar amount was used by us on various subsequent trips in a single day. On our first day eight hauls were made, mostly with a large beam-trawl. There was a very heavy swell, due to a violent cyclone that had prevailed further south a few days before. Under these circumstances, the dredging and the care of the specimens were unusually tiresome. otherwise our enthusiasm would, perhaps, not have allowed us to retire, even at midnight. But a touch of genuine seasickness will dampen the ardor even of the most enthusiastic naturalists when hundreds of new and strange species are before them.

This first trip having been so successful, two others were made, later in the season, to other parts of the slope, in depths ranging from 85 to 500 fathoms. Each trip proved equally productive, and added many species to the long list of discoveries.

In 1880 the headquarters of the fish-commission were at Newport, R.I.; but in 1881 and 1882 they were at Wood's Holl, Mass., where a laboratory had already been fitted up in 1875. In 1881 and 1882 the exploration of the Gulf Stream slope was continued whenever the weather was sufficiently favorable to permit us to make a trip in the Fish Hawk without too much risk.

The steamer Fish Hawk, with which we have explored this region the past three seasons, was built particularly for use in the hatching of shad-eggs in the months of shallow rivers, and was therefore not adapted for service at sea, unless in fine weather. A much larger iron steamer—the Albatross, of 1,000 tons—has recently been built for the use of the fish-commission, and is now being fitted up expressly for deep-sea service, for which she will be in every respect well adapted, and will have the best equipment possible for such investigations at all depths. The examination of the bottom beyond the depth of about 700 fathoms has, therefore, been deferred until the completion of the Albatross.

In addition to the three trips made in 1880, seven trips were made by us in 1881 from Wood's Holl, and in 1882 five trips. During these fifteen trips, on each of which a single entire day was usually employed in dredging, we occupied about 113 stations. At nearly all these stations we used a large beam-trawl of improved construction (fig. 1, page 188). In a few instances we used a large rake-dredge (fig. 2). On every trip fine surface-nets, or towing nets (fig. 3), were used to capture free-swimming animals, whenever the motion of the steamer was sufficiently slow to permit this mode of collecting. In these towing-nets, and in long-handled dip-nets, we secured a great variety of pelagic creatures, such as jelly-fishes, Salpa, Sagitta, various small Crustacea, and especially large numbers of Etmoptera.

Our dredgings in this region now cover a belt about 160 miles long, east and west, and about 10 to 25 miles wide. The most eastern stations are south-east of Cape Cod; the most western are south of Long Island. They are mostly between 80 and 110 miles from the coast-line of southern New England (see map, p. 444.) The depths are mostly between 65 and 700 fathoms. Probably no other equally large part of the ocean basin, in similar depths, has been more fully examined than this. In addition to the regular work of the party during the season, Capt. Tanner made a special trip to the Gulf Stream slope, off Chesapeake Bay, in 1880, and another off Delaware Bay in 1881. On both of these occasions valuable collections were made, and additional data in regard to the depth and temperature were obtained. He occupied seven stations, in 18 to 300 fathoms, in 1880, and eight stations, in 104 to 435 fathoms in 1881. These dredgings show the direct southward continuation of the inshore cold belt, and the warm belt outside of it, as well as the cold deep-water belt, with but little change in the fauna of each.

PHYSICAL FEATURES OF THE REGION.

The total number of species of animals already obtained by us from the deep water in this area is not less than 800. The number already identified or described, and entered on our