sive, and important of industries, and to promote that careful collection and discussion of facts by means of which alone we can hope to deal in a satisfactory manner with the many difficult, practical, and scientific problems connected with fish and fisheries." At the banquet he laid especial stress upon the practical results which he hoped might result to the fisheries, and upon the importance of stimulating every possible scientific invention for the saving of life at sea.

The remark made by one of the speakers at the banquet — "that, by consenting to act as president of the exhibition, the Prince of Wales had done more than any man had ever done before for the fisheries of the world" — sounded strangely to an American; but, discounting the courtier element in this speech, the fact remains, that much of the success of the exhibition, and of its consequent possible benefit to Great Britain, is due to the active part which the Prince has taken in its interest.

The newspapers, from *Punch* to the *Times*, be they social, commercial, literary, comic, or scientific in their scope, are full of the exhibition. Many of them announce special numbers, or series of special articles, devoted to its discussion; while at least two periodicals, one an illustrated monthly, are established as its special exponents. The *Times*, which Emerson has told us thinks for all Englishmen, and 'is their understanding and day's ideal daguerrotyped,' gave an entire page on Monday to a description of the opening, and for several days has been printing editorials discussing the subject from various stand-points. It has printed a column article upon the exhibit of the United States, and promises two more special articles. In the first it is remarked, that, in variety and completeness of illustration, the collection from the United States is not surpassed by that of any of the foreign contributors. This verdict is confirmed by most of the editors, and in especially strong terms by *Land and water* and the *Field*, the two fishing-journals; the latter remarking, "The whole American court affords food for study, and, for completeness, is beyond comparison the best in the exhibition, whether as to fishing-vessels or fishing-gear." Especially gratifying is the letter sent to the *Times* by Gen. A. Pitt Rivers, the ethnologist, who draws attention to the fact that this is the only department in the whole exhibition which is arranged historically.

In the Chinese, Japanese, Scandinavian, and Dutch courts there are objects which the scientific student of the arts of life may pick out and arrange in their proper order in his own mind; but in that of the United States, following the method adopted in the National museum at Washington, something more is attempted to bring the department into harmony with modern ideas. "Models showing the development of the art of ship-building have been arranged in sequence; the various contrivances for catching fish have been shown in association with the rude appliances of savages, from which they sprang; and the improvements and varieties of recent times have been placed as far as possible in chronological order. This gives to the exhibition a value which is apart from commerce, and an interest which is beyond the mere requirements of fish-culture; and it may be regarded as one out of the many indications of the way in which the enlightened government of the United States marks its appreciation of the demands of science."

The press is full of plans for the practical outcome of the exhibition. Some of the editors expect to see fish cheaper; some, to see the cheaper kinds of fish coming into general use; some, to see fish of all kinds more generally used; some, to see an immense increase in the yield of the fisheries; some, to see legislation stricter and more strongly enforced. Professor Huxley, when asked what his expectations from the exhibition were, replied that he had none at present beyond a general awakening of interest in fish-culture and the fisheries, from which, in time, some good would certainly result. The conference to be held in June, for the discussion of various questions of practical and scientific interest, will doubtless be one of the most important features of the exhibition. Professor Huxley will deliver the opening address; and the words of wisdom which shall then be uttered must necessarily have much influence in determining what are to be the benefits of this great international convention to Great Britain and to the world at large.

RECENT DEEP-SEA SOUNDINGS OFF THE ATLANTIC COAST OF THE UNITED STATES.[1]

THE explorations of the Gulf Stream, instituted by Alexander Dallas Bache, superintendent of the coast-survey, and carried on under his direction between the years 1845 and 1860, though necessarily to a great ex-

1 Abstract of Appendix no. 19. Coast and geodetic survey report for 1882. Communicated by the superintendent of the U. S. coast and geodetic survey, Washington, May, 1883.

tent tentative in their nature, have furnished results of great interest and value to the navigator, have stimulated later researches, and have led to the adoption of a definite plan, according to which have been made the observations for depth and temperature in the waters of the Gulf of Mexico, the Caribbean Sea, and in those off the Atlantic coast of the United States.

At as early a date as practicable after the close of the civil war, a systematic investigation was begun by deep-sea sounding and dredging, combined with observations of surface, serial, and bottom temperatures, and of currents, in the Gulf Stream and in the Gulf of Mexico.

In a communication made to the National academy of sciences in 1880 by J. E. Hilgard, M.N.A.S. (*Amer. journ. sc.*, April, 1881), upon a model of the Gulf of Mexico, a condensed statement is given of the results of the exploration of the basin of this great inland sea, as derived from the work organized by Benjamin Peirce and Carlile P. Patterson, superintendents of the U. S. coast-survey. This exploration was begun by Assistants L. F. Pourtalès and Henry Mitchell, U. S. coast-survey, with the aid of Master R. Platt, U.S.N., in 1868, and continued by Commanders J. A. Howell and C. D. Sigsbee, U.S.N., in 1872–74 and 1875–78, in the coast-survey steamer Blake. With the improved methods of sounding, and the mechanical appliances perfected by Commander Sigsbee, the work in the Gulf of Mexico was brought to a successful conclusion, and under Commander J. R. Bartlett, U.S.N., it was extended to the Caribbean Sea.

Sketch no. 21, Coast and geodetic survey report for 1879, shows the soundings in these waters and their approaches, in depths ranging from 100 to upwards of 3,400 fathoms.

Similar investigations have since been prosecuted by Commanders Bartlett and Brownson, U.S.N., under the direction of Superintendents Patterson and Hilgard of the coast-survey, in the western part of the North Atlantic, — that great embayment, which, limited by Newfoundland on the north, and by the Windward Islands on the south, might be not inaptly named the Gulf of North America.

The depths and temperatures obtained by these officers, upon lines run normal to the coast across the course of the Gulf Stream, and upon other lines connecting with those run by H. M. S. Challenger in 1873, are shown upon the accompanying chart. A reference to it will make apparent the part taken by the coast-survey in developing the configuration of the ocean-bed between the Bermudas and the West India Islands, and northward to the banks of Newfoundland, and in defining the limits of the continental plateau, which, extending from the coast to the 100-fathom line, may be described as the western rim of this great basin of the North Atlantic.

It was from these explorations that data were derived for the construction at the coast-survey office of the relief model of the western part of the North Atlantic, now on exhibition at the London international exposition of fish and fisheries.

Some interesting details of his work have been communicated by Commander Bartlett, who, during the summer of 1880, was engaged in dredging and sounding off the coast in the vicinity of Charleston, S.C. The first line run revealed the remarkable character of the bottom.

The first sounding and haul was made in 142 fathoms, south-east of Cape Romain. After this, in steaming to the eastward, taking frequent casts to find the depth at which it was desired to dredge, to their astonishment the water did not deepen as they expected, and they had crossed the supposed axis of the Gulf Stream before getting 300 fathoms at any sounding. Commander Bartlett, in his report, says, "The bottom was hard coral rock, but the sounding-rod always brought up small fragments of coral. We found but very few traces of animal life on this bottom, but made good hauls on its edge. For fifteen miles or more from the 100-fathom line we found a very strong current setting to the south-west. When the trawl was down, we tailed in that direction, and dragged at the rate of 2 knots without steam. When in the Gulf Stream, we found the current to the northward and eastward 2.6 knots per hour. The water deepened east of the axis to 382 fathoms, but shoaled again to 337 fathoms."

The lines run during this and the following season showed the same unmistakable plateau extending from Cape Hatteras to the Bahama Banks, the depths increasing but slowly until about 500 fathoms, after which they increased rapidly to the great Atlantic basin, at a depth of between 2,000 and 3,000 fathoms.

Commander Bartlett says in his report of the second season, after completing this work, "The eighteen lines of soundings run normal to the coast from Jupiter Inlet, Fla., to Currituck, N.C., by the steamer Blake; and the observations taken by the hydrographic party under my command gave very interesting data in regard to the physical features of the bottom

of the ocean over which the Gulf Stream flows. Instead of a deep channel, which has been previously reported, our soundings show an extensive and nearly level plateau extending from a point to the eastward of Bahama Banks to Cape Hatteras. Off Cape Canaveral it is nearly 200 miles wide, and gradually decreases in width to the northward until reaching Hatteras, when the depth is more than 1,000 fathoms within 30 miles of the shore.

"This plateau has a general depth of 400 fathoms, suddenly dropping on its eastern edge to 2,000 fathoms. The soundings in the strength of the current were all taken with the 60-pound shot-sinkers, the time allowed for the sinker to reach the bottom being less than one minute to each 100 fathoms in depth. Most of the soundings taken each side of the stream when not in strong current were taken with a 36-pound lead on the sounding-wire, the lead being reeled back. . . . It will be observed from the bottom specimens that the course of the Gulf Stream can almost be traced by the character of the bottom.

"On each side of the stream the sounding-cylinder brought up ooze. In the strength of the current, the bottom was washed nearly bare, the specimens being small broken pieces and particles of disintegrated coral rock. This bare portion was very hard, and the sharp edge of the brass sounding-cylinder came up very much dented and defaced."

During the summer of 1882 the Blake, under command of Lieut.-Commander W. H. Brownson, was engaged in sounding off New-York entrance. The charts have hitherto shown a spot about 100 miles south-east of Sandy Hook known as the '145-fathom hole.' In her soundings, the Blake discovered this hole to have a most remarkable character.

Its depth varies from 150 to over 450 fathoms, the bottom being mud; and in about the centre a knoll of mud, gravel, and shell rises up to within 64 fathoms of the surface. The dividing-ridge between the hole at its deepest point and the deep water outside has a least depth of 129 fathoms. There seems to be a continuation of irregular character of bottom, which extends from Sandy Hook about south-east; for about 200 miles farther the depth is over 3,000 fathoms, surrounded by very much shoaler depths.

During the past winter the vessel has been engaged in developing the limit and general character of the great Atlantic basin between Bermuda and Bahama, and along the outside of the West India Islands as far to the eastward as St. Thomas. This cruise has been of great interest. The bed of the Atlantic is shown to have a general depth of 2,700 or 2,800 fathoms; and depths of over 2,000 fathoms are found almost if not quite in sight of most of the islands along the outside of the Bahamas, and even in the narrow passages between them. In one place the 2,000-fathom curve was found to approach the shore to within two miles and a half, giving an inclination of the bottom of over 38 degrees.

Not the least gratifying point of interest of this cruise was the successful sounding taken at the enormous depth of 4,561 fathoms, which, it is believed, is the greatest depth from which bottom specimens and temperature have been obtained.

The soundings shown on the sketch represent but a small part of the work performed by the officers of the Blake, as only the characteristic ones have been selected from a total of nearly 2,000. During the time actually engaged in sounding, the Blake has steamed over 7,000 miles, and probably as much more in going to the working-ground, and in gaining positions after being obliged to abandon them from heavy weather, want of coal, or from other causes.

Bottom-soil specimens have been saved for examination, and densities of the sea-water obtained at nearly all the greater depths. About 1,200 surface temperatures have been taken; and the observations of the temperature of the water between the surface and the bottom will number about 1,300.

THE PROTOZOAN PARASITES OF THE OYSTER.

M. CERTES has recently described the protozoan parasites or commensals of Ostrea edulis and angulata, resorting to a method used by the writer in studying the contents of the stomach of the O. virginica during the past summer. A pipette is introduced through the mouth of the animal into its stomach. After it is filled with the brownish, dirty-looking contents of the gastric cavity, the pipette is withdrawn, and emptied upon a slide or compressor, and the material carefully examined under the microscope, in order to learn the nature of the bill of fare of the animal, and to detect the presence of endoparasitic organisms. As found by the writer in the American oyster, M. Certes states that the oyster is omnivorous. Amongst the contents of the stomach, more or less disorganized, grains of pollen, mites, algae, crustaceans, diatoms, foraminifera, radiolarians, and, at certain times of the year, a