

XXXI.—PRELIMINARY REPORT ON A SERIES OF DREDGINGS
MADE ON THE UNITED STATES COAST SURVEY
STEAMER BACHE, IN THE GULF OF MAINE,

UNDER THE DIRECTION OF PROF. S. F. BAIRD, UNITED STATES FISH COM-
MISSIONER, DURING SEPTEMBER, 1873.

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Though it was the original intention to devote the month to an exploration of the Saint George's Banks, it was decided, on account of our defective boilers, to work nearer shore, and extend the work of the United States Fish Commission, for the season located in Casco Bay, the dredging operations being conducted under the charge of Professor Verrill. This involved an examination of certain unexplored portions of that great indentation lying between Cape Sable, Nova Scotia, and Cape Cod, which is laid down on the charts as the "Gulf of Maine."

Through the researches of Messrs. Stimpson, Verrill, myself, and others, in the Bay of Fundy, and of Drs. Gould, Wheatland, Stimpson, and others, in Massachusetts Bay, together with the very thorough examination of Casco Bay and vicinity, pursued during the past summer by Professors Baird and Verrill, we had obtained a very complete knowledge of the coast-fauna of New England north of Cape Cod. Moreover, the exploration of Saint George's Banks, made by Messrs. Smith, Harger, and myself last year in the *Bache*, had given us some idea of the nature of the sea-bottom, dredging having been carried on at a depth of 432 fathoms by Messrs. Smith and Harger.

It now remained to explore some interesting localities within Saint George's Banks, and at a distance from the coast. This report embraces an account of a reconnaissance of Jeffrey's Bank, lying south of Mount Desert Island; Cash's Ledge, another bank lying southwest of Jeffrey's Bank; of Jeffrey's Ledge, a northeastern submarine prolongation of Cape Ann; and Stellwagen's Bank, a northerly submarine extension of Cape Cod. As intermediate points were investigated, the series of dredgings may be regarded as conducted along six main lines running out easterly from the shore between Portland and Cape Cod.

On the 2d of September, the *Bache*, with Lieutenant Jaques temporarily in command, left Peak's Island, Casco Bay, the headquarters of Professor Baird, and made a harbor for the night at Booth Bay. Early the next morning, we ran out and dredged about "Monhegan Falls" in 60 fathoms, searching with dredge, tangles, and trawl for the arctic

coral, *Primnoa lepadifera*, a species of sea-fan, which grows about three feet in height. It is occasionally met with in the fiords of Norway at a depth of 300 fathoms, while fishermen have been said to find it on the ground known as "Monhegan Falls", and a specimen two feet high, from Saint George's Banks, is now in the Museum of the Peabody Academy of Science at Salem, Mass. Our efforts to find it were, however, unavailing.

We then ran out to Jeffrey's Bank, and trawled in 82 fathoms, bringing up a fine *Alecto* or *Comatula*, a near ally to the Crinoids. This was the first specimen taken by the Fish Commission during the summer. The head of another specimen was captured on Cash's Ledge. Near Jeffrey's Bank, we also dredged in deep brown mud, at a depth of 107 fathoms, with a temperature of $39\frac{1}{2}^{\circ}$, *Hyalonema*, apparently intermediate between *H. boreale* of Lovén and *H. longissimum* of Sars from Northern Europe. This had previously been found off Casco Bay by Professor Verrill. Interesting sponges, allied to *Holtenia*, also occurred. Everywhere on Jeffrey's Bank and Cash's Ledge the mud was reddish-brown, and was possibly brought by currents from the Bay of Fundy. This red mud probably extends as far west as the mouth of Kennebec River. The mud about Jeffrey's Ledge and in Massachusetts Bay is of the ordinary blue color.

At noon of September 4 the sea became too rough to dredge, and we ran into a harbor at George's Island, north of Monhegan, for shelter, and on the succeeding day returned to Portland for repairs.

On September 12 the Bache left Portland for a farther exploration of Jeffrey's Bank, and on the 13th a series of dredgings was made on each side of the southern extremity of it, at depths of 60, 105, and 100 fathoms, with excellent success. The weather appearing threatening, we ran into Portsmouth.

On the 16th we began to dredge on a line extending from Portsmouth to Cash's Ledge. Stopping to dredge on either side of Jeffrey's Ledge, we found, in a deep mud-hole, 95 to 98 fathoms, fourteen miles S. E. $\frac{1}{2}$ E. of Boon Island light, with a temperature of $37\frac{1}{2}^{\circ}$ and 41° ,* living *Schizaster fragilis*, a beautiful sea-urchin; *Molpadia oölitica*, a sea-cucumber, not previously recorded so far north on the coast of North America; *Macoma proxima* and *Aporrhais occidentalis*, two shells rivaling in size individuals dredged by the reporter in shallow water in Labrador; and tubes of *Spiochaetopterus typicus* Sars. This abyss, so near the shore, afforded the lowest temperature found during the month's work.

The results of the exploration on Cash's Ledge were extremely interesting. At depths ranging from fifty to eighty fathoms, over a hard, gravelly bottom, characterized by multitudes of *Ascidia callosa*, or sea-potatoes, the richest assemblage of life was found that we met with in

* The readings of both thermometers used are given, the lowest temperature, that given by a new Casella-Miller thermometer from the Smithsonian Institution, and probably nearly correct.

the gulf. It was a rare sight to see the tangle come in over the ship's side hung with that gorgeous star-fish, the bright-red *Astrogonium phrygianum*, measuring fully eight inches across, with lesser forms of sea-stars, *Asterias*, *Cribella*, and sand-stars, an enormous sea-spider or *Nymphon*, *Hyas aranea*, an arctic spider-crab, and a species of *Janira*, with beautiful sponges allied to *Tethya*, *Thecophora*, and *Holtenia*-like forms four or five inches in diameter, these latter appearing in the trawl with *Tealia* and tubes of *Cerianthus borealis* of Verrill, a large sea-anemone. The excitement was shared by the crew, some of whom aided in the tedious work of separating the collections from the strands of the tangle.

On our way back to Gloucester we again dredged on each side of Jeffrey's Ledge at depths of 112 and 118 fathoms, at the former station east of the bank dredging the rare *Myxine limosa* Girard, (hag-fish,) in soft mud, with a bottom temperature in both stations of 39°.

On the 23d, dredgings were made in Salem Harbor and off Marblehead. Two days, the 25th and 26th, were devoted to investigating the summit of Jeffrey's Ledge, at a distance of nine to eighteen miles east of Cape Ann. The temperature here was between 46° and 49° in about twenty-five fathoms, a difference of about ten degrees from that of the abysses on each side of this submarine elevation. Both here and afterward we used two dredges, one being thrown over from the bows, the other cast from the stern of the vessel, while the tangle was put over from the side.

On the 27th, we began to run a line of dredgings and soundings from Cape Ann to Cape Cod, crossing the middle of Stellwagen's Bank.

Dredging in depths between fifty and sixty fathoms in soft, blue mud, northwest of Stellwagen's Bank, in the deepest portions of Massachusetts Bay, the fauna was found to closely resemble that of similar localities on each side of Jeffrey's Ledge, the assemblage not more southern in character, while the temperature of the bottom water ranged between 41½° and 45° (two thermometers being used as before). In one haul of the tangle, ninety-five *Ctenodiscus crispatus*, the common pentagonal star-fish of muddy bottoms, were brought up, with several very large *Asterias vulgaris*? and several young *Solaster endeca* and *papposa*; also a gigantic *Corymorpha*, a hydroid polyp, six inches in height, and fully half an inch in diameter near the base. We found on Stellwagen's Bank, in 22-30 fathoms, coarse sand, temperature 48½° to 50½°, an abundance of *Mactra polynema*, the hen-clam, *Cyprina islandica*, a shell resembling the qualaug, and *Glycimeris siliqua*, with five sponges. The *Corymorpha* was abundant here, and the tangle brought up at a single haul from 300 to 400 star-fish, mostly *Asterias*. At night, about ten miles north of Cape Race, the tangle was kept over from half past ten until two o'clock, when it came up loaded with *Astrophyton*, or Medusa's-head, and other kinds of star-fish, the temperature being between 48° and 50°, at a depth of 34 fathoms.

But by far the most interesting results were obtained at a distance of about 20 miles east of Cape Race, in depths of 117 and 142 fathoms, with a bottom temperature of 39° to $43\frac{1}{2}^{\circ}$, the former (39°) probably the more accurate determination. Here, in a remarkably tenacious soft blue mud, we found indications of an intermixture of the abyssal fauna, characteristic of depths in the North Atlantic, between 100 and 1,000 fathoms, with a temperature of about 39° Fahrenheit. At the first station examined, in 142 fathoms, temperature 39° to 42° , a large female *Geryon*, of a deep-reddish flesh-color, occurred, having more spines on the carapace than in *G. tridens*, and with eggs. Associated with this arctic crab occurred two fragments of a true cup-coral, allied to *Cyathophyllum*. On submitting the specimen to Count Pourtales, he at once pronounced it a species of *Deltocyathus*, and, on comparison with specimens of *D. Agassizii*, Pourtales,* from depths ranging from 60 to 327 fathoms between Cuba and Florida, our specimens did not differ specifically. Pourtales remarks (page 15) that this coral has been pronounced by Dr. Duncan identical with the fossil species *D. italicus*, and, though closely allied, yet readily distinguished by the costæ and other characters. I may say here that the indications are that the coral was not transported to this spot. This is the only truly southern form which has occurred so far north. With the crab and coral occurred *Schizaster fragilis* and certain shells and worms.

The other station was ten miles northwest, in 117 fathoms, with the same soft, tenacious mud, the temperature $39\frac{1}{2}^{\circ}$ to $43\frac{1}{2}^{\circ}$. Here occurred a smaller *Geryon*, perhaps a male, and apparently, judging by Wyville Thomson's figures in his work "The Depths of the Sea" (page 88), identical with Kroyer's *Geryon tridens*. With this crab were associated shells and worms. This day ended our explorations, and at night the Bache arrived in Salem.

In my work I was assisted by Mr. C. Cooke, assistant in the Museum of the Peabody Academy of Science at Salem. I would also express my obligations to Captain Howell and the officers of the Bache for the efficient aid they rendered me.

* Illustrated Catalogue of the Museum of Comparative Zoölogy, iv. Deep Sea Corals. By L. F. de Pourtales, assistant, United States Coast Survey. 1871.