

of organic remains, and the absence of organisms in certain strata convinced him that they had been formed at great depths or deposited prior to the existence of organisms. He observed that the number of organisms belonging to colder regions increased with the depth of water, and in the deeper zones of warm latitudes species are noticed which are inhabitants of the littoral zones of the highest latitudes. Forbes also showed that all sea-bottoms are not equally fit for the development of life, for in all the zones he found areas less peopled than others, these areas being mostly formed of ooze and sand, and inhabited only by creatures whose remains were not likely to be met with in a fossil condition. He explains the alternation of layers with and without fossils by changes in the level of the sea-bottom of the time. The science of Oceanography was greatly advanced by the researches of Forbes, more especially with regard to the distribution of marine animals,¹ and in this respect Lovén also materially contributed to the science.

In 1845 Professor W. C. Williamson described some Foraminifera, Diatoms and Sponge spicules from some Mediterranean muds, and, in discussing the origin of limestone strata in shallow and deep waters, he suggests that the whole of the calcareous organisms may be removed by carbonated waters.²

In 1846 Captain Spratt, R.N., dredged from 310 fathoms, 40 miles east of Malta, eight species of Mollusca, and he expressed the opinion that life exists at much more considerable depths; later, when surveying the Mediterranean between Malta and Crete, he obtained fragments of shells from a depth of 1620 fathoms. Both Spratt and Lovén arrived at conclusions which proved the influence of temperature on the distribution of marine animals.

In 1851 Professor J. W. Bailey applied himself to the microscopic study of the soundings collected by the U.S. Coast Survey within 100 fathoms,³ and he showed the important part played by Foraminifera in the deposits some distance off the coast of New Jersey. Owing to the abundance of these calcareous organisms the deeper deposits differed considerably from the shore deposits, in which mineral particles, especially quartz, predominated. In 1856 he made known the nature of the soundings collected by Brooke in the Sea of Kamchatka in depths of 900 to 2700 fathoms.⁴ He remarks that in all the samples mineral matters diminished with increase of depth, and that while the mineral particles decreased the organic remains increased. Of organic remains Diatoms predominated,

¹ In 1850 Forbes presented his first general Report on the Marine Zoology of the British Islands to the British Association. This Report was of great importance to science, and in it he indicated the desirability of prosecuting further researches in the North Atlantic, opposite the Hebrides, around the Shetlands, and between the Shetland and Faroe Islands, thus pointing to a field of exploration which twenty years later became the scene of the investigations of Carpenter, Thomson, and Gwyn Jeffreys, and still more recently of Murray and Tizard.

² "On some of the Microscopical Objects found in the Mud of the Levant and other Deposits," &c., *Mem. Lit. and Phil. Soc., Manchester*, vol. viii. pp. 1-128, 1847.

³ "Microscopical Examination of Soundings made by the U.S. Coast Survey off the Atlantic coast of the United States," *Smithsonian Contributions to Knowledge*, vol. ii., article iii. pp. 1-15.

⁴ *Amer. Journ. Sci.*, ser. 2, vol. xxi. pp. 284-285, 1856.