

poor. The large increase in phosphate in these water samples is surprising. There is apparently as yet no suitable method for the preservation of water samples for phosphate analysis and results after storage must be interpreted with care.

A. P. O.

F. P. STOWELL. The Adsorption of Ions from Sea-Water by Sand. *Journal of the Marine Biological Association*, XIV, No. 4, pp. 955—966, 1927.

Starting from the observation that in a sea-water aquarium a slight concentration of the salts takes place in the sand of the filter beds, the author has examined the adsorption of these salts, first from sea-water and second from solutions of the individual constituents by a series of cleaned sands. The amount of adsorption from sea-water under standard conditions varies somewhat with the nature of the sand but the order of adsorption of the constituent ions is constant, viz. $Mg^{+2} > Na^{+} > Ca^{+2}$ for cations and $Cl^{-} > SO_4^{-2}, HCO_3^{-}$ for anions. The position of Ca^{+2} in the series is abnormal when compared with the series of Rona and Michaelis for adsorption of ions by charcoal. For all ions but Ca^{+2} adsorption is therefore probably a physical phenomenon. The abnormal adsorption of Ca^{+2} is to be explained by the fact that sand is not an inert adsorbing agent like charcoal and that continuous ionic interchange takes place between the Mg^{+2} and to a lesser extent the Na^{+} in the sea-water and the calcium silicates in the sand. This is demonstrated by percolating solutions of sodium chloride and magnesium sulphate through the sand when calcium appears in the filtrate.

While the chief interest of the results is chemical the abnormal adsorption of Ca^{+2} may possibly be of biological importance.

A. P. O.

F. S. RUSSELL. The Vertical Distribution of Plankton in the Sea. *Biological Reviews*, Vol. II, No. 3, June 1927. Cambridge.

The author gives in the present paper an account of our knowledge of the vertical distribution of plankton in the sea, reviewing the principal papers dealing with this question.

The literature about vertical distribution of plankton animals and plants in the sea is so extensive, that it has certainly been a very comprehensive work to collect and criticise all the more important observations made both in nature and in the laboratory in connection with this problem. The author gives the following plan for his work:

- 1) Information as to the various external factors that may or may not be of importance in controlling the vertical distribution of plankton organisms.
- 2) A general survey of our knowledge of the vertical distribution of plankton plants and animals in the sea, and the theories suggested by field observations.
- 3) The principal results obtained by experimental work, and the theoretical suggestions arising from them.

In the first section he discusses the various physical and chemical factors, which are supposed to have an influence upon the vertical distribution of plankton organisms and his conclusion is, that the most important external factors in this respect are light and temperature. The paper is primarily concerned with the behaviour of the zooplankton, but a short account of the vertical distribution of the phytoplankton is also inserted. Of considerable interest is a scheme given to illustrate the suggested classification of depth distribution of the different plankton communities according to various authors. As it has been shown by several investigators that the vertical distribution for any one species is not to be laid down within fixed limits but is liable to variation, the author has divided these variations under the following headings: 1) regional changes in vertical distribution, 2) seasonal changes, 3) daily changes, 4) ontogenetic changes, 5) changes due to spawning habits and 6) special variations due to hydrographical conditions. It is a very useful method to consider the different changes in vertical distribution in this way, stating briefly under the separate headings the various observations and explanations which have been put forward by the different authors. Concerning experimental observations on plankton animals the literature is fairly rich but the results of the various investigators are very often rather different, and the author emphasizes the point that it is necessary to know precisely the normal conditions under which the animals live in nature before studying the reactions in the laboratory. It seems most probable that light can be regarded as the most important controlling factor, but undoubtedly the question of vertical distribution in general is very complicated and we are very far from possessing a general theory explaining the whole problem. The author seems right to emphasize the point that far more observations in the field and in the laboratory are required, indicating how limited our knowledge really is about the behaviour and the distribution of plankton organisms in the sea. The importance of the present paper is very great, displaying as it does in a clear and useful manner our present knowledge from various points of view, and it will certainly serve as an incitement and point the way to lines of future research.

P. JESPERSEN.

J. TRAVIS JENKINS. *The Herring and the Herring Fisheries*. London, P. S. King & Son, Ltd. 1927.

The latest product of this fertile author deals with a subject that nowadays receives much attention. The bulk of the book is occupied by historical matter, only two chapters being devoted to the biology and the races of the herring. The present writer proposes to discuss these latter first.

The principal impression we get from reading these chapters on natural history is that they are somewhat fragmentary, as if the author has drawn his knowledge from occasional books, incidentally at his disposal. Hence it comes about that some subjects are treated in a cursory manner and others are unduly circumstantial. Why for instance dwell largely on the Arctic migration theory, now long since abandoned, and on the transportation of herring eggs to Southern countries? Why devote so much