

occupying fifty pages, is a chronological précis of this nature. The morphology of the vegetative or reproductive organs is treated in detail in another chapter, while a chapter entitled "Biological Notes" deals with pollination, the distribution of the seeds by the aid of ants, and some ecological notes based on the author's own observations.

#### LACUSTRINE FAUNA IN THE FAR EAST.<sup>1</sup>

THE two memoirs before us contain the first five of a series of reports upon material collected, for purposes of comparison with a corresponding ecology in the Indian fauna, by Dr. Annandale in certain lakes of the Far East, namely, in Lake Biwa in Japan, in Tai Hu Lake in the Yangtse Delta, and in Talé Sap, a lagoon on the eastern coast of the Malay Peninsula; with them is incorporated a short critical dissertation on Oriental Batrachia in general.

Lake Biwa, with an area of 269 square miles, lies among hills about forty miles distant from the sea; as it is more than 200 ft. deep in many parts and reaches a depth of 320 ft. in some places, and as there is considerable difference in summer temperature between the open surface and the depths, there is some variety in its biological conditions. Tai Hu, about sixty miles in length and in breadth, is a muddy lake of uniform conditions, nowhere exceeding 12 ft. in depth; though it is forty miles from the sea and its water is quite fresh, its fauna contains a distinct marine or estuarine element. Talé Sap differs from the other two lakes in lying on the seaboard and having a narrow sea-inlet; like the Chilka Lake in Orissa, it consists of two distinct basins of unequal density—though the inner basin is fresh, or practically so, throughout the year—and so presents variable conditions; the greatest depth of the main fresh-water portion is about 16 ft.

The collections described in the present instalments are the Polyzoa in part (Entoprocta and Ctenosomatous Ectoprocta), the Mollusca of Lake Biwa, and the Hydrozoa and Ctenophora, all by Dr. Annandale himself, the aquatic Oligochæta by Col. J. Stephenson, I.M.S., and the aquatic Hemiptera by Mr. C. A. Paiva. Most of the reports are distinguished by attention to anatomical details and to biological interpretations of fact.

The Polyzoa comprise five species from Talé Sap and two from Tai Hu. Two of them (*Triticella pedicellata* and *Paludicella elongata*) have not before been recorded from tropical latitudes. A third noteworthy form, closely akin to Loxosomatides, but differing in the arrangement of the muscles of the stalk, is distinguished as a new genus, *Chitaspis*.

The Mollusca of Lake Biwa include twenty-nine species, of which eleven are restricted to this lake and eleven others are peculiar to Japan. Most of the genera (*e.g.* *Limnæa*, *Planorbis*, *Vivipara*, *Bithynia*) are cosmopolitan, or (*e.g.* *Anodonta*, *Valvata*) palæarctic, or, like *Melania* and *Corbicula*, of common occurrence in tropical and subtropical latitudes. The author distinguishes a rupicolous community of species quite distinct from that inhabiting the mud and sand in shallow water, and a congeries of species restricted to the depths, among the latter being the only representatives of *Pisidium* and *Valvata* occurring in the lake.

Among the Hydrozoa identified are *Cordylophora lacustris*, from Tai Hu, and five species from the brackish parts of Talé Sap. A description of a new genus of *Hydromedusæ*, *Asenathia*, from the Gangetic Delta, is also included; this the author suspects to be

the sexual generation of the curious hydroid *Annulella* recently described by Ritchie from that part of Bengal.

Among the aquatic Oligochæta, *Branchiura sowerbyi* and *Limnodrilus socialis* were found in association here as in India; a new species of *Chaetogaster* commensal in sponges is described, and a new genus *Kawamura*—a *Branchiura* without gills and having the penis-sac provided with a penis—from the depths of Lake Biwa. Col. Stephenson also describes a new species of *Criodrilus*, found at the remarkable depth of 180 ft. in this lake.

The aquatic Hemiptera are for the most part common Oriental forms; but *Microvelia sexualis*, from Talé Sap, is a new species of *Hydrometrid* representing a genus hitherto known only from North America.

#### CARBONISATION REACTIONS.<sup>1</sup>

IT is difficult to obtain clear information about the reactions in carbonisation by the direct distillation of coal in the laboratory, especially about minor, though important, products such as toluene, benzene, etc., of which the quantities available become excessively small. Therefore the author, in conjunction with Dr. S. F. Dufton, chose to investigate the stability of individual compounds in different atmospheres when passed over heated coke, with a time of contact of the same order as met with in carbonising practice. The behaviour of the compounds was dependent on conditions of temperature and concentration, apparently in accordance with the laws of chemical dynamics. Benzene, at varying partial pressures in an atmosphere of nitrogen, which was assumed to be inert, showed signs of incipient decomposition at 550° C., leading to the production of diphenyl. At higher temperatures this was more extensive, and *p*-diphenylbenzene also appeared. The former condensation at least is reversible. Benzene in an atmosphere of hydrogen yielded much less diphenyl under otherwise similar conditions, and at 800° C. is scarcely decomposed at a concentration of 5 per cent. by volume, while diphenyl in an atmosphere of hydrogen is reduced to benzene. This doubtless accounts for the practical non-occurrence of diphenyl in coal-tar, although this substance is readily formed from benzene in the absence of hydrogen. Benzene did not yield naphthalene or unsaturated compounds. At 900° C., even in hydrogen, benzene was extensively broken down with the formation of carbon. Toluene in nitrogen shows signs of decomposition at 550° C., but there are now two possibilities—reactions through the nucleus and also through the side chain. The product is more complex, a solid being formed, which was identified as stilbene ( $\text{CH}_2\text{C}_6\text{H}_5$ )<sub>2</sub>, and also an oil. At 750° C. decomposition was more extensive, naphthalene and anthracene being identified among a number of other products. On substituting hydrogen for nitrogen the decomposition was much accelerated, but with the production of benzene and methane and smaller quantities of solids. The formation of stilbene, which occurs with the liberation of hydrogen, is inhibited. Methane and benzene react in the reverse direction to form toluene, but only very slowly. Thus hydrogen protects benzene from decomposition, whereas it decomposes toluene, but in the sense of breaking off the side chain while hindering molecular condensations with elimination of hydrogen, which are a characteristic effect of heat on the lower aromatic hydrocarbons. The xylenes resemble toluene in behaviour, while cresol is reduced by hydrogen at 750° C. to toluene, and necessarily to benzene also. The importance of atmosphere

<sup>1</sup> "Zoological Results of a Tour in the Far East." Edited by Dr. N. Annandale. *Memoirs of the Asiatic Society of Bengal*, vol. vi., pp. 1-74 and pp. 75-115.

<sup>1</sup> Abstract of the William Young Memorial Lecture of the North British Association of Gas Managers, Glasgow, September 6, 1918, by Prof. John W. Cobb.