

but still with wide differences between the continents as to the extent of such seas.

It is an interesting fact, bearing on the conditions under which the Liassic beds were made, and the facility with which the clear open waters of a fossiliferous limestone horizon may change to the confined waters of a sea border, that a bed of limonite or ferruginous limestone occurs in the Lower Lias northwest of Lincolnshire, England, which is 27 feet thick, and in the Upper Lias, near Bath, two feet thick; on the continent, in Lorraine, in the Upper Lias, 10 to 50 feet thick, containing *Ammonites*, a *Gryphæa*, *Trigonia navis*, etc.; in Auxois, France, near the base of the Lower Lias overlying a bed of "lumachelle" limestone; and, as stated by C. Moore, in *western Australia*, in the Middle Lias, a very ferruginous limestone, which on analysis gave 49 to 56 per cent of metallic iron. Moore goes so far as to regard the ferruginous bed of Australia as proof of Liassic age; the associated fossils are much better evidence.

But with all the resemblance in physical conditions between Europe and America, there was a remarkable contrast in the abundance of marine life in the continental seas. This contrast was especially great in the Jurassic period. The number of species of Jurassic Invertebrates thus far described from the American rocks is less than 250; very few of these are Corals, 17 are Cephalopods, 5 Echinoderms, 17 Gastropods, 113 Lamellibranchs (Whitfield). In the Jurassic of Great Britain alone the number of known marine species, as stated by Etheridge (*Geol.*, 1885), is over 3900; those of Corals 236, Echinoderms 208, Ammonites 417, Belemnites 112, Gastropods 988, and Lamellibranchs 1319. More study may quadruple the number of American species; but this will little diminish the contrast.

As indications of the climate of the Triassic and Jurassic periods, there are these pertinent facts from the Arctic regions: that the species *Ceratites Malmgreni*, *Ammonites Gaytani*, *Nautilus Nordenskiöldi*, *Halobia Lommeli*, *H. Zitteli* were living in the Spitzbergen seas during the Triassic period; and *Ammonites (Harpoceras) M'Clintocki*, *Monotis septentrionalis*, and species of *Pleurotomaria* and *Nucula*, about Bathurst Island, Exmouth Island, and Prince Patrick Island, probably during the Jurassic period, — species that have closer relations to European than to American species (Haughton, Waagen); that *Ichthyosaurs* were living in Triassic or Jurassic time about Exmouth Island (77° 16' N., 96° W.), their remains having been found on this island by the Belcher Expedition; and that other *Ichthyosaurs* existed in the Spitzbergen seas, probably during the Triassic period, remains of two having been found by Nordenskiöld, which have been named, by Hulke, *Ichthyosaurus Nordenskiöldi* and *I. Polaris*; that another Saurian — "probably a Dinosaur, allied to the Anchisauridæ," inhabited the region about Bathurst Island, Captain Sherard Osborn having brought home a vertebra, which has been made a basis of a species named by A. L. Adams *Arctosaurus Osborni*.

The continent of North America, as already explained (page 47), is peculiar in climatal situation. It has the Gulf Stream warm with tropical