

which is one of the greatest interest in connection with the distribution of marine animals, will be fully discussed in a future chapter. The broad conclusions to which we have been led by late investigations are, that instead of there being a permanent deep layer of water at  $4^{\circ}$  C. the average temperature of the bottom of the deep sea in temperate and tropical regions is about  $0^{\circ}$  C., the freezing-point of fresh water; and that there is a general surface movement of warm water, produced probably by a combination of various causes, from the equatorial regions towards the poles, and a slow under-current, or rather indraught, of cold water from the poles towards the equator. From cases which are recorded, chiefly by the earlier American sounding expeditions, of the sounding-line having been run out into long loops in soundings where, from the nature of the sea-bed, the bottom water appeared to be still, it would seem that there are also in some places intermediate currents; but with reference to their limits and distribution we have as yet no data. That a cold flow from the polar seas passes over the bottom seems to be proved by the fact that in all parts of the world wherever deep temperature soundings have been taken, from the arctic circle to the equator, the temperature sinks with increasing depth, and is lower at the bottom than the normal temperature of the crust of the earth; an evidence that a constantly renewed supply of cold water is cooling down the surface of the crust, which, being a bad conductor, does not transmit heat with sufficient rapidity to affect perceptibly the temperature of the cold indraught. It is probable that in winter, in those parts of the arctic sea which are not directly influenced by