

organisms may be supposed to have been adapted to certain external conditions prevailing in the water-layers which surround them. But these water-layers are not stationary, and the conditions in a certain water-layer may change in many different ways from time to time. These changes alter the habitat of the animals and cause active or passive migrations. The study of these migrations is specially interesting as showing the influence of physical conditions acting upon the animals.

From time immemorial it has been known that many animals ascend at night to the surface of the ocean. Fishermen have during ages turned this knowledge to advantage in setting their drift-nets at night at the surface of the sea to capture the herring. Recently it has proved possible to trawl successfully for herring along the sea-bottom, but only during the daytime. All sailors can tell us that at night great numbers of animals gather in the surface waters, which are never seen there in the daytime. An interesting instance of this was mentioned in Chapter IX. While fishing with long-lines on the Faroe banks our lines were set for cod along the bottom in about 200 fathoms; the lines were hauled at night, and the stomachs of the cod contained squids, which had been eaten during the day, while at night numerous squids were seen at the surface darting into the glare of our electric lamp hanging over the side. Most fishermen have had similar experiences.

Daily vertical migrations.

A certain amount of information has also been gathered as to the vertical migrations of minute pelagic organisms moving towards the surface at night. Chun especially has investigated the extent of these migrations, and found that the majority of small pelagic organisms migrate generally within a vertical range of 30 to 50 metres. Steuer draws attention to the fact that vertical migrations very rarely involve all the pelagic forms of a locality; at all events they do not migrate in the same manner, for there are many transitions between forms which only retreat vertically during a few hours in the daytime, and forms which rise only during the darkest nocturnal hours. If the forms were large enough to be seen in the water, we should "by day as well as by night be able to observe a continuous rise and fall of organisms. Only during the day we should see a larger congregation in deeper water, and at night at the surface."<sup>1</sup>

Some instances of the difference plainly observable in our catches by day and by night have already been mentioned

<sup>1</sup> Steuer, *op. cit.*