

larval stages living at the surface to the adult fishes of the deep sea, presents a vast field for future research and opens up a vista of possibilities, which may explain the adaptation to special surroundings peculiar to each species.

Investigations in the deep regions below 500 metres should evidently, first of all, attack the questions whether a regular decrease in the size of the eye occurs with increasing depth, and whether the number of blind species and blind individuals is not far greater than is generally supposed. Our pelagic hauls only exceptionally went below 1500 metres, but nevertheless we found in the deepest hauls no less than three species of blind fishes, of which two were new to science, besides one blind squid. In the deep oceans, where the depth exceeds 5000 or 6000 metres, we might perhaps expect interesting discoveries if large and efficient appliances were towed after the vessel with 5000 or 6000 metres of wire out.

But if it be the case that the size of the eyes in pelagic fishes decreases vertically with the decreasing intensity of light, how can we explain the fact that the bottom-fishes, like *Macrurus armatus*, living in abyssal depths possess large and apparently well-developed eyes? In order to explain this, the possible existence of a source of light other than sunlight has been sought for, but nothing has so far been discovered beyond the light produced by the organisms themselves. We shall therefore have to consider at the same time the power of emitting and the power of perceiving light possessed by the animals, so that we must take their light-organs as well as their eyes into account.

From what has been said we see that a remarkable coincidence exists between the development of light-organs and eyes in pelagic fishes. The Scopelidæ, Sternoptychidæ, and Stomiatidæ, which live above 500 metres, possess well-developed light-organs and eyes, while from 500 metres downwards light-organs and eyes both decrease in size.

Along the sea-bottom, however, the fishes possess only eyes and no special light-organs. We have previously seen that the invertebrates are luminous even in abyssal depths, and at present the large eyes of the bottom fishes cannot be explained otherwise than by supposing that the light emitted by the invertebrate bottom animals is so strong that objects on the bottom may be seen by the eyes of fishes. As regards most of the bathypelagic fishes we may, on the other hand, suppose that they have little use for eyes, because pelagic life in great depths is scanty, and not so definitely localized as on the sea-bottom.

Large eyes in abyssal fishes from the sea-bottom.

Abyssal bottom fishes have eyes but no light-organs.