

By the expansion of the air-bladder the œsophagus and stomach are pressed out of the mouth and the eyes out of their sockets. Cod-fishers are therefore in the habit of puncturing the air-bladder, in order to keep the fish alive. Every larger collection possesses specimens showing the inverted stomach and œsophagus; and they may be safely assumed to have been captured at some distance from the surface.

We might expect that the air-bladder of deep-sea fishes would offer special modifications; and, indeed, there is sufficient evidence that in many a special muscular apparatus is developed for the compression or expansion of its contents, to enable the fish to rise into a higher, or descend into a lower stratum. But, unfortunately, in all the specimens examined by me the air-bladder was more or less ruptured and broken up, and destroyed by subsequent decomposition. One point only seems to be clearly made out, viz., that abyssal life has exercised no influence on the development of an air-bladder, that is, deep-sea fishes whose nearest surface-relations possess an air-bladder, are provided with this organ also, and *vice versa*. In none of the abyssal forms examined by me have I found an open communication between the air-bladder and the œsophagus, not even in those which are referred to the Physostomous division.

The branches of the muciferous system are dilated in many deep-sea fishes to an extraordinary degree. Sometimes it is only the lateral line which is conspicuously wider than in the allied surface forms (*Lepidopus tenuis*, many Scorpenidæ), but in many others, as in Berycidæ, Macruridæ, Ophidiidæ, and Scopelidæ, the branches on the head are enlarged into wide cavities, the walls of which are supported by high ridges of the superficial bones. Frequently the membranes investing these cavities are very thin and after the death of the fish liable to be destroyed, so as to leave bare the deeply sculptured surface of the skull; in other fishes the outer membranes collapse in consequence of the shrinking of the mucous contents of the cavities, so that the surface of the head appears to be extremely uneven; whilst again in others, as in the majority of the genus *Macrurus*, the integument is sufficiently tough to maintain the natural contours of the head. The arrangement of the cephalic branches is the same as in Teleosteous fishes generally: the rostral branches bifurcate into the frontal and infraorbital, and pass into the scapular branch which is the commencement of the lateral line; and the mandibular and præopercular branches are likewise invariably present. All these cavities and canals are filled with an immense quantity of mucus, which, in specimens that have not been too long preserved in spirits, swells by immersion in water, and can be pressed out of the apertures of the canals. These apertures may be wide slits, or more or less open, or minute pores with or without a tubule. The physiological use of this secretion, as, indeed, the function of the whole system, is not known. Whether it be regarded as an excretory or as a sensory organ, it is clear that its extraordinary development in so many deep-sea fishes must stand in relation to some one of the abyssal conditions under which they live; and it is very probable that some special function or functions are superadded