

animal, since they are invariably present, and undergo modifications with sexual and specific variations; the inner, on the other hand, is of less importance, and seldom varies except in relation to length, in some forms being reduced to a minimum, or, as in *Lucifer*, it is wanting altogether.

Although in all Decapod Crustacea the first pair of antennæ consists of a peduncle and one or more flagella, yet the organ undergoes modifications in the different orders.

In the Trichobranchiata it may be considered as typical of the Macruran form, such variations as exist being common to the other divisions.

The most simple form exists in the Synaxidea, of which that in the Palinuridæ may be taken as the most normal. In these the peduncle consists of long narrow cylindrical joints, projected on an exposed portion of the antennal somite, and terminating in two slender flagella of nearly equal length. The first or basal joint is generally longer than the others, and increases in diameter towards the articulation with the somite; within this enlarged portion an acoustic organ exists, that undergoes modifications in the different genera. In *Palinurus*, *Homarus*, and *Astacus* the perforation is long, narrow, and slit-like, the aperture being scarcely appreciable, and opens into a calcified chamber, more or less filled with particles of sand, which are voluntarily placed in position by the animal soon after casting its exuvium,<sup>1</sup> and although the joints of the peduncle are cylindrical or nearly so in *Palinurus*, *Ibaccus*, *Homarus*, &c., yet in some genera of the Astacidea they undergo certain modifications, as, for instance, in those animals in which they are laterally compressed, the approximating sides being flattened against each other, and this is carried to such an extent in some genera of the Eryonidæ (as in *Willemæsia*), that the inner margins are pressed together, forced upwards, and thus form a vertical ridge in the median line.

The second and third joints of the peduncle are of little importance, and apparently only serve as carriers of the terminal flagella. In the ordinary or most simple form they are merely cylindrical joints, but in some species they are broad and short, having the distal angles produced to strong teeth.

Each of the two flagella arises from its own distinct base at the extremity of the third joint, one obliquely above the other, that on the outer and upper side being the more robust, and built up of a number of short rings or articuli, which are more or less abundantly furnished with protective hairs or spines, and amongst them are always a considerable number of flexible membranous tube-like cilia, that vary somewhat in form corresponding with other generic characters.

These membranous cilia were, I believe, first pointed out by myself in a memoir On the Homologies of the Carapace and on the Structure and Function of the Antennæ in Crustacea,<sup>2</sup> in which it is stated that the cilia "are always larger than ordinary hairs,

<sup>1</sup> This was first pointed out by Dr. Farre in 1843, *Phil. Trans.*, vol. cxxxiii. pp. 233-242.

<sup>2</sup> *Ann. and Mag. Nat. Hist.*, July 1855.