

single row of luminous cells in the usual epithelium, and a lens formed by the cuticula or chitinous layer of the epidermis. In squids and fishes the organs are very complicated, as we shall presently see.

The object of the "Michael Sars" Expedition being mainly the investigation of the distribution of animals, the examination of the collections has necessarily been limited to the determination of the species, and my contributions to this fascinating section of the science of marine life will largely consist in discussing the distribution of animals possessing light-organs, which occur in salt water only, for no luminous animals are known from fresh water and no phosphorescence occurs there.

Glandular, clearly defined, and localised light-organs are found mainly in pelagic animals. Among bottom animals from the coast banks luminosity is exceedingly rare, but on the other hand, many bottom animals have been brought up from the abyssal region in a luminous condition, and have continued to emit light when placed in dark surroundings on board (see Fig. 70, p. 88, representing a luminous umbellularian). No special luminous structure has been found in these cases, the luminosity being attached to the surface epithelium. As regards fishes, Günther has drawn attention to the fact that many deep-sea forms secrete a large amount of slime. The heads of many deep-sea Macruridæ exhibit certain pits and channels, which produce great quantities of slime. This slime is supposed to be luminous, and to perform the function of ordinary glandular light-organs, which last are found only in a few fishes supposed to live along the bottom, for instance, sharks (Spinacidæ, *Spinax niger*), and even in these they occur only as isolated organs, not in such numbers as in the genuine luminous fishes.

Among the pelagic fishes of the coast banks no species is known to possess light-organs; neither the herrings nor the mackerels have any representatives with light-organs. As shown in Chapter IX. there is not a single independent pelagic fish-species in the northern boreal waters, and as a consequence no boreal pelagic fish-species possesses light-organs.<sup>1</sup> A minute examination of the lower forms has never been made, and at

Light-organs found principally in pelagic animals.

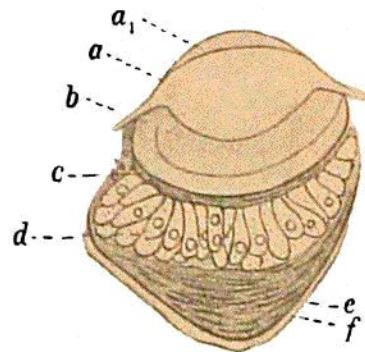


FIG. 492.

Light-organ of *Sergestes challengeri*, H. *a*, lens of the chitinous cuticle; *b*, inner lens; *c*, glandular cells; *e*, reflector; *f*, cover. (After Hansen, from Steuer.)

<sup>1</sup> I regard the Scopelidæ in the Norwegian Sea as visitors, and not as true boreal forms.