

cruise of the "Challenger" Sir John Murray captured them from a boat in calm weather floating at the surface of the ocean, where they were just visible to the naked eye. On the ocean-floor in moderate depths in tropical and sub-tropical regions the dead shells occur in such enormous numbers that the deposit is called Globigerina ooze. The species and individuals decrease in number as we go north or south from the tropics, and in the Norwegian Sea only one species, viz. *Globigerina bulloides* (see Fig. 118, p. 150), occurs in any abundance either at the surface or in the bottom deposits.¹

Radiolaria. The Radiolaria occur in a profusion of species. The cell possesses a central capsule containing the nucleus or nuclei and an outer layer of protoplasm capable of throwing out very thin threads (pseudopodia). The skeleton is developed in various ways and facilitates the discrimination of an enormous number of sharply separated forms (see Figs. 110 to 117 in Chapter IV.). In his report on the "Challenger" Radiolaria, Haeckel described no less than 20 orders, 85 families, 739 genera, and 4318 species, taken partly from the deposits and partly in the tow-nettings; in one single bottom sample from 4475 fathoms in the Pacific 338 species were found. The Radiolaria are wholly pelagic, and occur in all oceans where the salinity is not too low (as it is in the Baltic), over deep water as well as over shallow water, attaining their maximum development in the Pacific.

In order to discuss their distribution we may mention some of the typical groups:—

The Acantharia are mostly spherical; the perforations of the central capsule are regular. The skeleton consists of acanthin, a peculiar elastic organic substance, in the form of twenty needles radiating from the centre of the sphere. The majority of the species occur in tropical waters and in the upper layers of the ocean. They are divided into two groups, Acanthometra and Acanthophracta.

In a vertical haul in the Atlantic Popofsky² found no less than 75 species of Acanthometra alone, and a haul in the Indian Ocean procured a similar number. North and south from the equator the number of species decreases, the majority living between lat. 40° N. and 40° S. The different regions of this warm belt have many species in common. According to Popofsky the total number of known species is 179, of which only 18 have been found in the Atlantic to the north of lat. 50° N., and 10 of these are known only as casual or seasonal visitors. The commonest forms in northern waters are *Acanthochiasma fusiforme*, *Acanthometron pellucidum* (Fig. 389), *Acanthonidium echinoides* (Fig. 390), *Phyllostaurus quadrifolius*, *Acanthostaurus nordgaardii* (Fig. 391).

It is generally supposed that the temperature limits the bathymetrical distribution of the Acantharia, just as it is known to limit their horizontal occurrence. In the Atlantic the German Plankton Expedition found the deepest living species at a temperature of 9.4° C. In the Mediterranean, where high temperatures occur deeper, they have been

¹ See Murray, "On the Distribution of the Pelagic Foraminifera at the Surface and on the Floor of the Ocean," *Natural Science*, vol. xi. p. 17, 1897.

² Popofsky, "Acanthometriden," *Ergeb. Plankton-Expedition*, Bd. iii., 1904; "Die nordischen Acantharien," *Nordisches Plankton*, No. xvi.