Some considerations on the distribution of Acantharia and Radiolaria in the eastern Mediterranean*

by

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The Acantharia and Radiolaria of the Eastern Mediterranean have been studied in recent years both in the course of routine cruises along the coast of Israel as well as during periodic cruises to the Eastern Mediterranean waters, mostly during the summer. The samples collected during 1962 covered a complete year cycle of the regular grid of stations located in the inshore waters of the coast of Israel, while the plankton samples collected during the Cyprus 02 cruise to the eastern Mediterranean [OREN & ENGEL, 1965; Engel, 1967], Cyprus 03 (KIMOR & BERDUGO, 1967; OREN, 1967], and the Pillsbury cruise to the eastern Mediterranean during 1965 [KIMOR & FERGUSON WOOD, *in preparation*] provided material for offshore studies.

Following is a list of the species identified from the above material, arranged according to their systematic position within the Acantharia and the different orders of Radiolaria :

Acantharia

1. *Acanthometra pellucida* Müll.
2. *Amphilonche elongata* Müll.
3. *Heliolithium aureum* Schew.
4. *Lychnaspis giltschi* Haeck.
5. *Lithoptera mülleri* Heack.

Spumellaria

1. *Arachnosphaera myriacantha* Haeck.
2. *Cyphonium ceratospyris* Haeck.
3. *Euchitonia mülleri* Haeck.
4. *Heliosoma echinaster* Haeck.
5. *Hexacontium asterocanthion* Haeck.
6. *Hexalonche amphisiphon* Haeck.
7. *Rhizoshphaera trigonocantha* Haeck.
8. *Spaerozoum* sp.
9. *Spongotrochus brevispinus* Haeck.
10. *Spongurus* sp.
11. *Staurosphaera jacobi* Haeck.
12. *Stylochlamidium astericus* Haeck.

Nasselaria

1. *Archicircus hertwigi* Haeck.
2. *Arachnocorys circumspecta* Haeck.
3. *Eucyrtidium ciankowskii* Haeck.
4. *Lamprodiscus laevis* Hertw.
5. *Pterocorys caribata* Haeck.
6. *Sethocyrtis oxycephalus* Haeck.

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7. *Theoconus zancleus* Haeck.
8. *Theopilium cranoides* Haeck.
9. *Sethophormis eupilium* Haeck.

From the point of view of the horizontal distribution, most of the Acantharia species listed above were often, but by no means always, recorded in the offshore waters of the eastern Mediterrannean. The Spumellaria, on the other hand, were recorded at stations closer to the mainland and often at greater depths, the same being true of the Nassellaria species recorded during these cruises.

A salient point regarding their distribution is that many of the species listed in the systematic account occur in surface waters in the Mediterranean Sea during the winter season and sink to deeper levels during the summer. As most of our collections were carried out during the summer, samples collected by closing nets from levels below 200 metres, often contained species hitherto considered as mainly surface forms characteristic of the winter season. Thus, many of the species mentioned by TRÉGOUBOFF and ROSE (1957) belonging both to Acantharia and to Radiolaria and described as winter surface forms, were recorded in our samples collected during the summer at much deeper levels. All the Spumellaria identified up to specific level in our material fall, according to these authors, in this category and the same is also true of the Nasselaria species. Regarding the Acantharia, *Heliolithium aureum* and *Lychnaspis giltschi* are described as occuring between 0 - 400 metres, *Acanthometra pellucida* between 0 - 800 metres while the remaining two species, *Amphilonche elongata* and *Lithoptera mülleri* are recorded by the same authors as occuring at all levels, presumably up to 1 000 metres which is the deepest level for the Mediterranean referred to by them for plankton sampling.

The Pillsbury cruise to the eastern Mediterranean undertaken in the summer of 1965 covering 30 stations between Pyraeus and Haifa provided firther evidence in this respect. By using special equipment and techniques for deep water sampling both for plankton and water samples, it has been possible to detect several species of Radiolaria and even of Acantharia, in a viable condition, at much deeper levels than hitherto recorded in this marine environment. The two deep water stations where extensive plankton sampling was carried out during this expedition were station 12, east of Rhodes, where the recorded depth is 4,389 metres (35°55'N; 28°00' E) and station 32, 1,646 metres deep situated about half way between Cyprus and the Nile Delta (32°55' N; 32°00' E). At these stations vertical and in some cases horizontal hauls were made by use of closing nets fitted with opening and closing devices through water strata below the standard 200 metre depth down to the sea bottom. [KIMOR & FERGUSON WOOD, *in preparation*].

An analysis of these samples on board ship while still in a living condition, revealed the presence of several species, referred to above, at these abyssal depths, often in association with viable zooxanthellae. The viability of the zooxanthellae associated with the radiolarians as well as of a few other species of free living algal cells was determined by flourescence.

Considering the fact that the ability for vertical migration of these protozoans is limited to within a few hundred metres, the presence of some of the species at depths of 2,000 - 3,000 metres or even more in association with viable zooxanthellae suggest the possible existence of contributors to the primary productivity far below the photic zone.

Among the species of Acantharia found at such considerable depths, is *Lychnaspis giltschi* recorded in our material from the Pillsbury expedition at depths of 3,000 - 2,000 metres and 1,000 — 500 metres respectively. It was previously reported by SCHEWIAKOFF (1926) from off Naples between 400 - 600 metres. Additional un identified species of Acantharia were also recorded from similar depths at the same station (Pillsbury 12) and even deeper levels, between 3,000 - 4,000 metres.

Species of Spumellaria were also recorded from the deep water strata at the same station and among the Nassellaria identified to specific level *Sethophormis eupilium* between 1,000-500 metres.

In a general way this phenomenon of the sinking of winter epipelagic species of Acantharia and Radiolaria to deeper water strata during the summer months is also characteristic of other groups of microplankton in the Mediterranean Sea. JÖRGENSEN describes this phenomenon in great detail with regard to the Mediterranean Ceratia (1920) and to the Mediterranean Dinophysiaceae (1923). The scarcity of specimens of individual species as compared to the actual number of species present in the eastern Mediterranean plankton which is comparatively high is another trait of similarity between the radiolarians and these groups of dinoflagellates. Further work on present and future collections will undoubtedly augment the list of species as well as complete their pattern of spatial and temporal distribution.

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