DINOFLAGELLATE CYSTS FROM THE SEDIMENTS OF THE EUTROPHIC EASTERN HARBOUR OF ALEXANDRIA, EGYPT

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Abstract

A sediment core from the eutrophic zone of the Eastern Harbour of Alexandria is examined for organic carbon content, grain size and dinoflagellate cysts. The rate of sediment deposition is abnormally high in the sink area of downstream from the outfall, but there is an obvious seasonal trend. Cyst deposition follows a parallel trend, accelerating by the end of summer. *Pyrophacus* sp. cyst are dominant in the core. The stratification of *A. minutum* cysts confirms its observed disappearance from the plankton.

Key words: Alexandria. Dinoflagellate cysts. Eutrophication. Alexandrium minutum

The Eastern Harbour (E.H.) of Alexandria is a semicircular, semi-closed bay, about 2.4 km in its greatest width. It is surrounded by the City along its southern margin and communicates with the sea on its northern side. The bay has always been the recipient of large volumes of domestic waste water from several point sources. In 1996-1997, however, all effluents but one were closed, the same volume of waste water becoming disposed of through the remaining effluent on the south-west bay margin. Since Halim (1), recurrent heavy blooms and red tide outbreaks, caused mostly by *Alexandrium minutum* Halim, have been documented and described (2, 3, 4, 5). After its toxic outbreak in 1994 (5), *A. minutum* appears to have become gradually extinct, being replaced by several other potentially harmful species. Its disappearance has been attributed by Ismael and Halim (6) to erosional instability of the bottom sediments bearing its cysts and caused by active hydrodynamic forcing. It should be mentioned that nothing is known about sediment cysts from Egyptian waters.

Three 18 cm cores were collected from three equidistant stations along the north-south axis of the bay. They were sliced into 2 cm fractions, subjected to grain size analysis and their organic carbon content determined. The fractions retained by the 20 μm sieve was sonicated and microscopically examined.

We report here on core 1, collected immediately downstream from the outfall, from the sink area. The lower layer of the core corresponds to the year 1996-97, the year the outfall became fully functional, and the upper most layer to the sampling year, 1999.

The organic carbon (OC) content increased from 0.9% to 5.4% at the high average sedimentation rate of 6cm year^{-1}. there is a clear cut seasonal trend, the sinking rate accelerating during summer, the season of maximum sewage outflow. Winter brings an apparent reversal in the OC content, as the oxidation rate at the sediment-water interface exceeds the rate of sewage deposition. The correlation between OC content and grain size is significantly and negatively correlated.

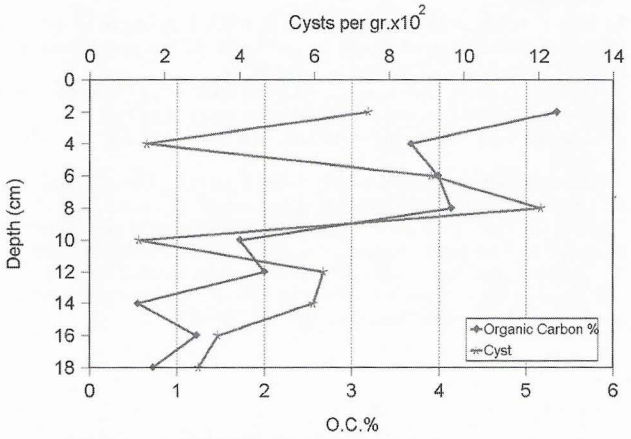

Fig. 1. Organic carbone and dinoflagellate cyste in core 1

There is a striking parallelism between the OC content and the stratification of the dinoflagellate cysts in the core. The profile of cyst abundance is also seasonally clear cut, with an increased rate of cyst deposition at the end of the summer blooming season followed by a slow down in winter. *Pyrophacus* sp. cysts contributed 44% to the total core, followed by *Lingulodinium* sp. (13%), *Scrippsiella* sp.(12.5%), undetermined cyst 1 (12%), *Alexandrium minutum* (8%), undetermined cyst 2 (7.6%) and *Protoperidinium* sp. (3%).

The stratification of *A. minutum* cysts appears to confirm the interpretation of Ismael and Halim (6). While in the layers corresponding to the years 1996-1997 and 1998, respectively, 40 to 125 and 20 to 120 cysts per gram were deposited, none were found in the layer corresponding to 1999. This distribution is in agreement with the observed disappearance of the species from the plankton.

References:

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