

The composition and distribution of living coccolithophores in the northeastern Mediterranean Sea

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A study on living coccolithophores from the euphotic zone in the north-eastern Mediterranean Sea was used to determine the species spatial and temporal variations. A total of 98 plankton samples from 24 stations in the North Aegean (Athos, Skyros and Limnos basins), Central Aegean (Cyclades Islands, Saronikos and Evoikos gulfs), South Aegean (Antikythira straits, Cretan Sea, Rhodos gyre) and south-eastern Ionian Sea, have been collected during several sampling periods between 2001 and 2014. These stations fall along some established N-S trophic gradients from mesotrophic to ultra-oligotrophic regions. The former involve the NE Aegean Sea east off Limnos island (under the direct influence of the Black Sea waters inflowing into the Aegean through the Dardanelles Straits), the Saronikos and Evoikos gulfs and the Rhodes cyclonic gyre. All the rest, represent oligotrophic to ultra-oligotrophic environments, where annual mean chlorophyll *a* concentrations hardly pass 0.2 µg l⁻¹ and picophytoplankton cells (cyanobacteria, picoeukaryotes) dominate (45 - 80%) both autotrophic biomass and production.

The coccolithophore distribution was quantitatively documented through Scanning Electron Microscopy in terms of density, diversity and community structure. A total of 86 coccolithophore species were identified. *Emiliania huxleyi* is the most abundant species with early spring concentrations up to 27 x10³ cells l⁻¹, typically constituting more than 40% of the coccolithophore assemblages. Other characteristic species like *Syracosphaera molischii*, *Algirosphaera robusta*, *Syracosphaera pulchra*, *Gephyrocapsa ericsonii*, *Syracosphaera protrudens*, *Rhabdosphaera clavigera*, *Umbellosphaera tenuis* and *Helicosphaera carteri* often exceed 10³ cells l⁻¹. Holococcolithophores are well represented, with *Syracosphaera pulchra* HOL *oblonga*, *Coronosphaera mediterranea* HOL *wettsteinii*, *Helladosphaera cornifera* and *Algirosphaera robusta* HOL being the most abundant species. The studied coccolithophore communities indicate a close relationship between coccosphere densities and surface water circulation, with the sea temperature gradient affecting species composition. High species diversities associated with dominance of K-selected

taxa *Rhabdosphaera* and holococcolithophores were recorded during summer, whereas low diversities coupled with maximum cell concentrations were observed during late autumn-early spring and typically associated with dominant *Emiliania huxleyi*. In general, cell numbers are usually higher in the upper and middle photic zone (~60 m water depth). In the lower photic zone, the presence of *Florisphaera profunda*, *Algirosphaera robusta* and *Syracosphaera anthos* becomes important, making up the typical deep assemblages.

Emiliania huxleyi in the Eastern Mediterranean Sea provided strong evidence for seasonal variation in coccosphere and coccolith size, morphology and calcification. Biometric analysis showed a consistent relation of increase in the size of coccoliths and coccospheres, including the thickness of the inner tube elements (INT), with low sea surface temperatures and moderate productivity, during winter and early spring season. A better assessment of this relationship will be obtained from a current study in the NE Aegean Sea, within which a seasonal sampling of coccolithophore assemblages is coupled with biogeochemical and productivity measurements, also involving CO₂ concentrations, bio-optical studies and remote sensing of the study area.

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