

# TOXIC PHYTOPLANKTONIC SPECIES IN THE SEA OF MARMARA

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## Abstract

Plankton studies in the Sea of Marmara have been continuing since the 1990s, leading to the identification of 11 toxic species. These studies did not show a significant increase in the individual numbers of toxic species. The recent change in water quality in the Marmara Sea suggest a possible increase of density of these species.

*Keywords: Toxic micro-algae, Sea of Marmara*

The Sea of Marmara is a relatively small inter-continental basin with a surface area 11500 km<sup>2</sup> and a volume of 3378 km<sup>3</sup> (Fig. 1). It is connected to the Black Sea and the Aegean Sea through the straits of Bosphorus and the Dardanelles, respectively. The basin is occupied by two distinctly different water masses throughout the year: one is the brackish waters (22-26 p.s.u) of Black Sea origin, forming a relatively thin surface layer (10-15 m thick) with a mean residence time of ~4-5 months, and the other is the subhalocline waters of Mediterranean origin (38.5-38.6 p.s.u.) separated from the former by a sharp interface (pycnocline) ~10-20 m thick [1;2]. The chemical oceanography of the Sea of Marmara is significantly influenced by the biochemistry of the Black Sea and the Aegean Sea. In the upper euphotic zone, concentrations of nutrients are relatively low and show seasonal fluctuations that reflect the photosynthetic activity [3]. Since primary production is always limited to the less saline upper layer (15-20 m) of the Sea of Marmara, the subhalocline waters of Mediterranean origin are always rich in nutrients [4].

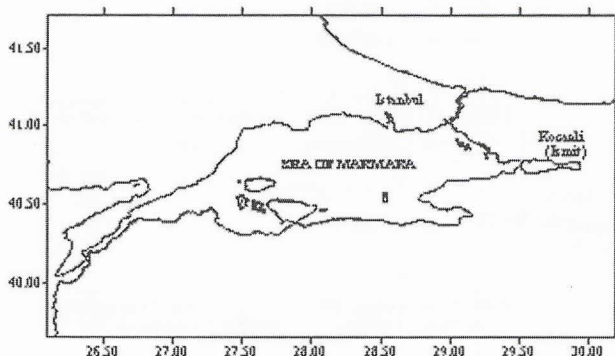


Fig. 1. Map of the Sea of Marmara.

Plankton studies in this sea have been continuing since the 1990s and there are only few data on phytoplankton and their ecological features [5-10]. A summary of the information on the toxic species in the Sea of Marmara is given in Table 1. Previous studies in the Sea of Marmara did not record a significant increase in the individual numbers of toxic species. The possibility of red-tides is discussed only in the project studies (unpublished data) of Izmit Bay. These toxic species reported from the seas of Turkey, caused fish mortalities, anoxia and hyperoxia in Izmir Bay [11].

The Black Sea has become polluted by river (mainly the Danube) and wastewater discharges. Because of the large volume of water inflow from the adjacent Black Sea (about 600 km<sup>3</sup>) into relatively small upper layer volume (about 225 km<sup>3</sup>) of the Sea of Marmara, the upper layer ecosystem of the latter has been influenced to a large extent [1;2]. In the next years, an increase in the abundance of these species may be observed. For this reason, these species should be monitored carefully by the studies programmed in this region, due to the dangerous effects of toxic algal blooms on human and ecosystem health, causing great economic damage to aquaculture and tourism.

The aims of this study are to constitute a toxic species list and to update the regional records on this basis.

**Table 1. Toxic phtoplanktonic species in the Sea of Marmara.** (Abbreviations: mc, maximum cell number in one liter; T, type of toxic effect; PSP, Paralytic Shellfish Poison; DSP, Diarrhetic Shellfish Poison; ASP, Amnesic Shellfish Poison; R, References).

Species	mc	T	R
<b>DINOPHYCEAE</b>			
<i>Alexandrium minutum</i>	net sample	PSP	10
<i>Dinophysis acuminata</i>	2x10 <sup>2</sup>	DSP	10
<i>D. acuta</i>	6x10 <sup>2</sup>	DSP	10
<i>D. caudata</i>	2x10 <sup>3</sup>	DSP	5,10
<i>D. fortii</i>	3x10 <sup>2</sup>	DSP	10
<i>D. sacculus</i>	3x10 <sup>2</sup>	DSP	10
<i>Gonyaulax grindleyi</i>	1.3x10 <sup>3</sup>	DSP	10
<i>Phalacroma rotundatum</i>	6x10 <sup>2</sup>	DSP	10
<b>BACILLARIOPHYCEAE</b>			
<i>Pseudo-nitzschia delicatissima</i>	2.7x10 <sup>3</sup>	ASP	6,7
<i>P. pseudodelicatissima</i>	net sample	ASP	10
<i>P. pungens</i>	2x10 <sup>2</sup>	ASP	6,10

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