

Benthic foraminifera as a tool for Environmental Evaluation in Thermaikos Gulf, NW Aegean Sea

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Thermaikos Gulf is a semi-enclosed, shallow basin in the northwestern part of the Aegean Sea (Fig. 1A). The environmental setting of the area is defined by the three major rivers, two minor ones and several ephemeral streams (Lykousis *et al.*, 2005) that flow into the basin, while the gulf is characterized by eutrophication being one of the most anthropogenically impacted coastal regions of Greece. During the high precipitation period (January-May), the freshwater intrusion can extend southwards enough to seal a major part of the gulf's surface waters (salinities <25 psu). On the other hand, more saline waters from the northern Aegean Sea flow towards the northeast, entering the inner Thermaikos Gulf (Kontoyannis *et al.*, 2003; Fig. 1B).

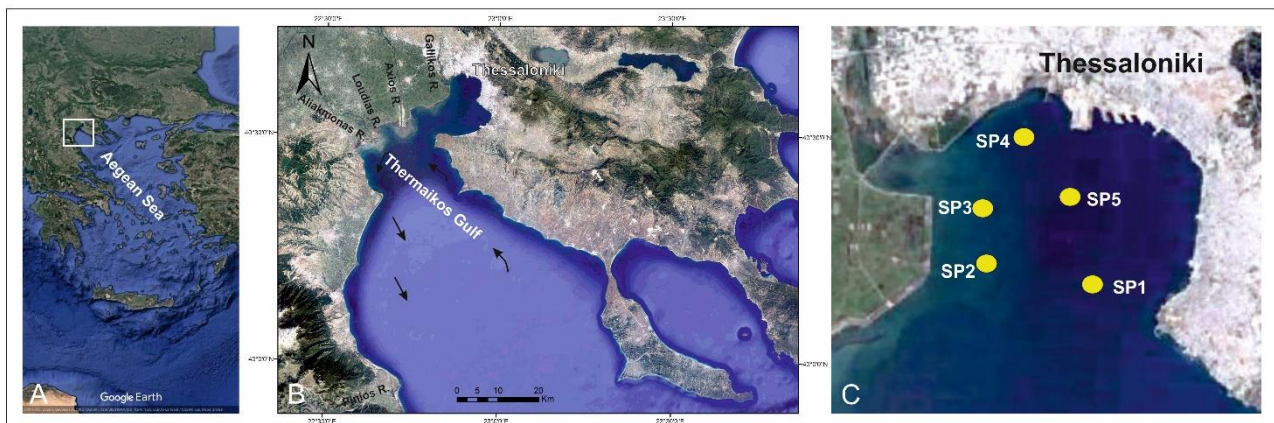


Figure 1. A) Location map of Thermaikos Gulf, B) water circulation and main rivers discharging in the gulf, C) sampling stations at the inner part of the gulf.

The aim of this study is to explore changes in the foraminiferal abundance and composition, as compared to a multi-parameter environmental dataset (temperature, salinity, pH and nutrients), magnetic susceptibility and metal content, during a twelve-month monitoring. Sampling of the top 2 cm of the surface sediment was carried out on a monthly basis (December 2015-December 2016) at one station (SP1), and at 5 stations (SP1-SP5) during winter (February 2016) and spring (April 2016), located in Thessaloniki Bay (inner part of the Thermaikos Gulf). Sampling followed the standardized FOBIMO method (Schönfeld *et al.*, 2012), while field measurements at the maximum depth of each station were also conducted. Furthermore, the Foram Stress Index (FSI; Dimiza *et al.*, 2016) was calculated, in order to evaluate the environmental status.

Foraminiferal assemblages were dominated mostly by *Bulimina* spp., *Bolivina* spp., *Uvigerina* spp. and various species of agglutinated foraminifera, such as *Textularia bocki*, *Eggereloides scaber*, and *Leptohalysis scotti*. The foraminiferal assemblage also included *Ammonia tepida*, *Haynesina depressula*, *Nonionella turgida*, *Lobatula lobatula* and miliolids.

During late spring-summer (April to August), foraminiferal densities and relative percentages of the living specimens displayed the highest values, while high diversities (Shannon-Wiener index) were observed during winter. The investigated samples for February and April sampling periods were variable with respect to both abiotic parameters and the foraminiferal assemblage, characterized by a mix of stress-tolerant and more sensitive taxa. Samples from the western part of the gulf were characterized by a diverse assemblage that included *Bulimina* spp., *Bolivina* spp., agglutinants, miliolids and a variety of small, epiphytic rotaliid taxa. The rest of the gulf presented a monotonous fauna, dominated mostly by stress-tolerant species. FSI values suggested poor/bad to moderate conditions prevailing, while good environmental status has been defined during April at only one station from the western part of the gulf.

The variability in foraminiferal composition reflects the exceptional environmental conditions that prevailed in inner Thermaikos Gulf, thus providing further evidence for the species' seasonality in comparison with the anthropogenic impact.

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