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Meiofauna, microflora and geochemical properties of the late quaternary (Holocene) core sediments in the Gulf of Izmir (Eastern Aegean Sea, Turkey)

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ABSTRACT

The Gulf of Izmir has seen the construction of marinas at four locations; Karşıyaka, Bayraklı, İnciraltı and Urla (Çeşmealtı). Six drilling holes have been structured for each location. Morphological abnormities observed in foraminifer tests, obtained from these core drillings, and coloring encountered in both foraminifer tests and ostracod carapeces, provide evidence of natural and unnatural environmental pollution. The objectives of this study are to identify micro and macro fauna, foraminifers in particular, contained within sediments in the above-mentioned locations; to investigate the background of pollution in the Gulf Region; and to determine pollution's impact upon benthic foraminifer and ostracods.

Çeşmealtı foraminifera tests did not lead to color and morphological changes. But foraminifera tests samples collected from Karşıyaka, Bayraklı and İnciraltı led them to turn black (Plate 4–6). However, concentrations of heavy metals (Ni, Cr and Mn) obtained from the sediments of Karşıyaka, Bayraklı and İnciraltı locations are higher than those obtained from the Çeşmealtı samples and high concentrations of these elements may be the cause of the color change in the samples during the foraminifera tests. In Karşıyaka and Bayraklı ostracod samples, *Bosquetina carinella, Pterygocythereis jonesi, Semicytherura* species; in the Çeşmealtı/Urla zone, *Cyprideis torosa*; in İnciraltı, *Pseudopsammocythere reniformis;* and in four zones, *Loxoconcha* and *Xestoleberis* species were observed in the range of relative frequency. The same analyses were done on nannoplankton but they did not lead to color and morphological changes.
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1. Introduction

Turkey's Gulf of Izmir similar to the shape of a boot facing towards the east is on the northern end of the Karaburun Peninsula and south of the Aslan Cape line. In the center of the gulf are Uzun and Hekim Isles and in the north, from Urla Harbor, one can view the Çiçek Island groups. The Uzun Isle gulf, extending from the north to the south, is divided into two parts. To the east it connects to part of Izmir Harbor via the Gülbahçe Bay, Menteş Gate (Fig. 1).

There have been many studies examining the relationship between the fauna of the current sediments of Izmir Bay and its heavy

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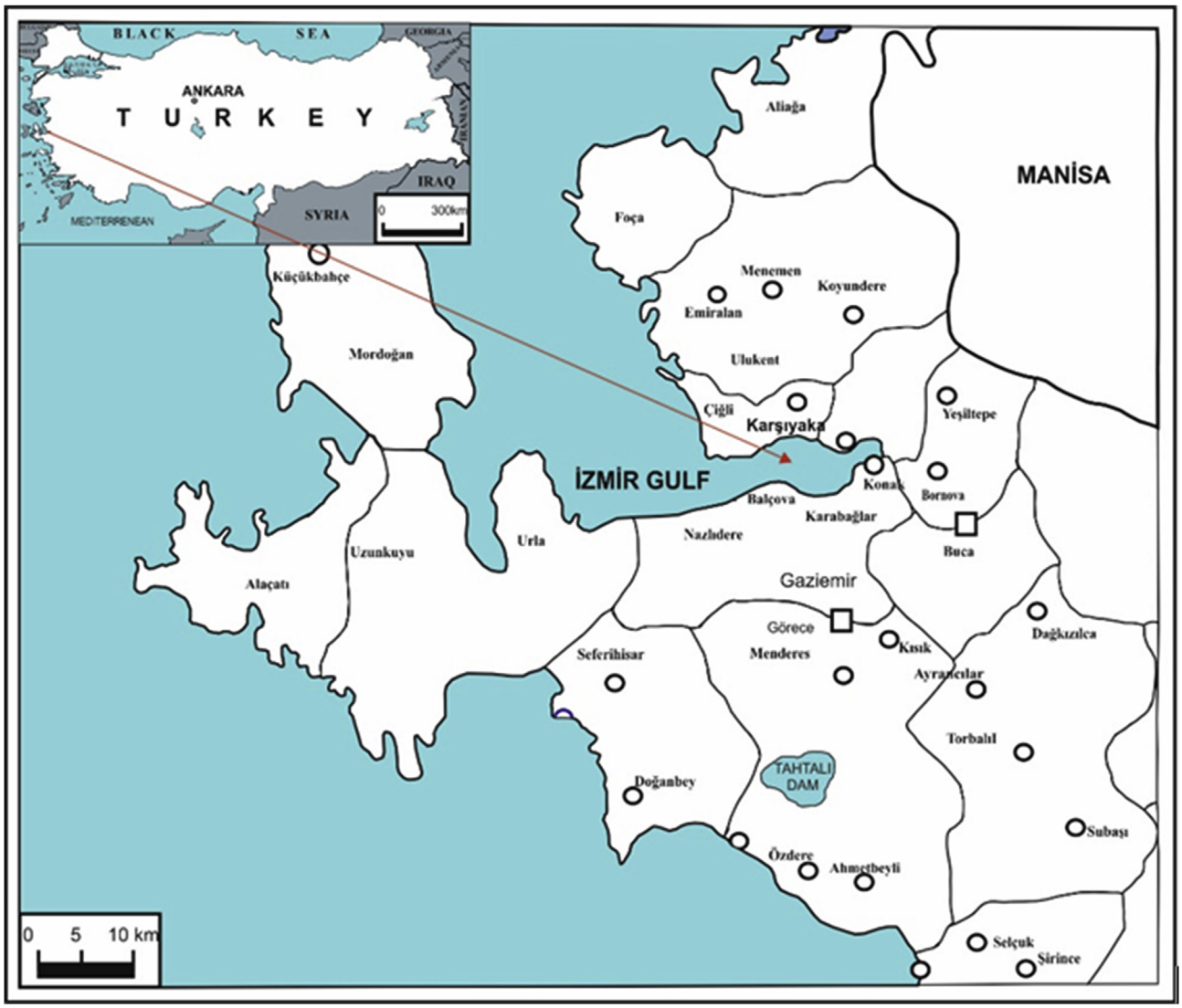

Fig. 1. Location map of investigation area (İzmir Gulf).

metal contents (Akgün, 1995; Bergin et al., 2006; Erdoğan, 2009; Meriç et al., 2009). Akgün (1995) identified palynoflora insamples collected from the bottom sediments of Izmit Bay during drilling. Depending on palynological data, he stressed that palaeovegetation in and around Izmit Bay did not change between 1.000.000 years and 6.000 years and that conifer and oak forests (*Pinus, Quercus* and *Abies*) spread throughout the region. Akgün (1995) further pointed out that the young sediments of Izmit Bay developed under the damp-cool climatic conditions of the pluvial period and that the effect of these climatic conditions remained unchanged for a long time as a result of marine influence. Erdoğan (2009) conducted a study on heavy metal pollution in sediments along Izmir Bay. The study investigated the sediments in areas of Izmir Bay where marine pollution is observed, and statistically evaluated (the detected) concentrations of heavy metals. The analyses of heavy metals (Cr, Cd, Co, Ni, Pb, Mn, Zn, and Cu) in the sediments were performed using an ICP-MS device. However, the study did not investigate the relationship between the concentrations of heavy metals and flora or fauna. Meriç et al. (2009) carried out a study on the effect of thermal mineral water sources in the Eastern Aegean Sea Coastal regions on benthic foraminifera communities. They investigated reasons for the differences in benthic foraminifera shells detected in different locations of the Aegean Sea between 1986 and 2009. In addition, they investigated the causes of benthic foraminifera shell forms they observed in the Aegean Sea that are normally found in the Red Sea and the Indian and Pacific Oceans. The authors demonstrated that variations in shell structure are associated with hydrothermal sources of Bergin et al. (2006) investigated the effect of heavy metal pollution on 16 spot (instantaneous) samples of ostracod and foraminifera communities. The study noted that the numerical abundance of foraminifera is not directly associated with heavy metal contents in the sediments. In addition, the study points out that the number of foraminifera is at its maximum in areas where mostly treated waters are discharged into the sea. The current study, on the other hand, investigated drillhole samples for variations in heavy metal concentrations over time and their effects on ostracods, nannoplanktons, foraminifera and mollusks.

In the Gulf of Izmir, due to the construction of marinas in four separate locations; Karşıyaka, Bayraklı, İnciraltı and Urla (Çeşmealtı), six core drillings have been done for each location (Fig. 2, Table 1). In these locations sea water depths ranged from 1.00 to 13.00 m. The drilling intersected young sediments at depths between 1.00 and 22.00 m. This paper used core specimens from one single drilling in these zones with the objectives of

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