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Fauna and flora of drilling and core data from the İznik Lake: The Marmara and the Black Sea connection

Engin Meriç [a], Atike Nazik [b, *], Zeki Ü. Yümün [c], Yeşim Büyükmeriç [d], Niyazi Avşar [b], Ayşegül Yildiz [e], Enis K. Sagular [f], Hayrettin Koral [g], Erkan Gökaşan [h]

[a] Moda Hüseyin Bey Street No: 15/4, 34710 Kadıköy, İstanbul, Turkey
[b] Çukurova University, Faculty of Engineering-Architecture, Geological Engineering Department, 01330, Balcalı, Adana, Turkey
[c] Namık Kemal University, Çorlu Engineering Faculty, Environmental Engineering Department, 59860 Çorlu, Tekirdağ, Turkey
[d] Bülent Ecevit University Faculty of Engineering, Geological Engineering Department, 67100 Zonguldak, Turkey
[e] Aksaray University, Faculty of Engineering, Geological Engineering Department, 68100 Aksaray, Turkey
[f] Süleyman Demirel University, Faculty of Engineering-Architecture, Department of Geological Engineering, 32260, Çünür, Isparta, Turkey
[g] İstanbul University, Faculty of Engineering, Geological Engineering Department, 34320, Avcılar, İstanbul, Turkey
[h] Yıldız Teknik University Natural Sciences Research Center, 34349, Davutpaşa, İstanbul, Turkey

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ABSTRACT

The study deals with on the Quaternary connection of the Iznik Lake between the Gemlik Gulf and the Black Sea located in the Marmara Region. The core and drilling data were evaluated. They were collected at two locations and depths from drilling cores and at the three deepest locations of the lake. A total of 510 samples were examined from the lake-bottom cores. Ostracod, mollusc, nannoplankton, ascidian spicule, and diatom assemblages observed at different levels of the drillings were studied. No foraminiferal data were recorded. Molluscan association such as *Dreissena bugensis, D. caspia*, *Monodacna pontica*, *Clathrocaspia makarovi*, *Euxinipyrgula milachevitchi*, *Euxinipyrgula lincta* indicate Neoeuxinian age. *Amnicythere olivia, A. stepanaitysae, A. striatocostata, Tyrrhenocythere amnicola* and *Loxoconcha immodulata* of the ostracod assemblage, exhibiting Ponto-Caspian origin, were found. In addition, fossil ascidian spicules comprising various species of *Bonetia*, *Micrascidites*, *Monniotia*, and *Rigaudia* genera were encountered, probably representing Late Pleistocene to Holocene ages. *Campylodiscus echeneis*, *Cocconeis placentula* var. *lineata Epithemia turgida* var. *granulata*, *Epithemia adnata*, *Nitzschia commutate* and *N. vermicularis*, from the diatom assemblage are genera and species also found in the İznik Lake and in the Black Sea. Mollusc and ostracod fauna, the Ponto-Caspian origin indicates that the İznik Lake was connected with the Black Sea and the Marmara Sea in the recent period. Thus, the Ponto-Caspian assemblages indicate the early Neoeuxinian (Surozhian) brackish water inundated the study area.

Geochronological ages determined by the ^{14}C method from the deposits occurring at 53–54 m above present sea level in the İznik Lake indicate the periods of connection via Iznik Lake during 33,630 to 32,920 cal BP (SK-1) and BP 27,335 to 27,070 cal BP (SK-2). When the position of the deposits is compared with the previously available Late Pleistocene ^{14}C data obtained from the molluscs identified in the nearby Gemlik Gulf at −76 m present water depth and also with the early Khazarian (Middle Pleistocene) age data on the molusc fauna at 130–150 m heights of uppermost terraces above present sea level to NW of the lake, we suggest the influence of a neo-tectonic regime for the occurrence of comparable age deposits at different levels in the region. It may be proposed that a vertical displacement in the order of a 100 m occurred since the late Pleistocene in the İznik Lake area and the lake acquired its present features as a result of the tectonic movements.

1. Introduction

The study area is the İznik Lake, which lies in the southeast of the Marmara Region where strike-slip tectonics is an effective

* Corresponding author.
E-mail address: anazik@cu.edu.tr (A. Nazik).

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geological process (Figs. 1 and 2). To study the connection of the İznik Lake with the Gemlik Gulf and the Black Sea in the recent period, foraminifera, ostracod, mollusc, didemnid ascidian, and diatom assemblages were investigated in the young deposits obtained from the drillings and cores collected from the east, north, and south parts of the lake. A rich assemblage of ostracods, molluscs, nannoplankton, didemnid ascidians, and diatoms were identified in the deposits, benthic foraminifera characterizing either marine or brackish environments were not encountered.

Many geological surveys have been carried out for various purposes at the İznik Lake and in its vicinity. The studies covered the geochemistry and paleolimnology of the İznik Lake in the recent ages (Franz et al., 2006), the role of the İznik Lake in the waterway connecting the Marmara Sea and the Black Sea (Meriç et al., 2009; Nazik et al., 2011), marine occurrences along its coastal cliffs (Erginal et al., 2012), lithostratigraphic, geochronological and paleoenvironmental studies (Roeser et al., 2012), the impacts of seasonal hydrochemical changes in the İznik Lake on sedimentological variations (Viehberg, 2012), climate and environmental changes in the İznik Lake (NW Turkey) in the last approximately 4700 years (Ülgen et al., 2012), the paleolimnology of the İznik Lake in the past approximately 31 ka BP (Roeser, 2013), and the palynological data of the İznik Lake since the last ice age with regard to the impacts of humans and climate on plants (Miebach et al., 2016). In this study, nannoplankton and didemnid ascidian spicules have been studied for the first time, and ostracod, mollusk and diatom have been studied in detail than previous works. In addition, the oldest numerical age for the deposits of the İznik Lake is obtained in *Dreissena* shells collected from the drilling samples.

In previous studies, bivalves and gastropods of Ponto-Caspian origin were identified in the first 1.00 m section of the core collected by Taviani et al. (2014) in the Gemlik Gulf at 76.00 m water depth. They were determined to characterize the Neoeuxinian period with respect to faunal assemblages and numerical age. In particular, the ascidians identified in the uppermost deposits of the İznik Lake indicate that the lake and the Marmara Sea were connected in the recent times. It also suggests that most of the sedimentation has occurred in littoral or lagoonal environments. Furthermore, it is determined that the age ranges represented by the identified ascidian spicule types were mostly Late Pleistocene, taking into account the studies by Varol and Houghton (1996). All findings from the previous studies and from this study indicate the possibility of a former waterway connection between the Marmara Sea and the Black Sea via the İznik Lake and the Gemlik Gulf.

In this study, sediments within the İznik Lake are investigated with regard to ostracod, mollusc, didemnid ascidian, and diatom content and their biostratigraphical ages. Data obtained will be compared with those available in the literature to establish possible similarity between sediments of adjacent water bodies, namely the Black Sea and the Marmara Sea and possible routes of connections between these basins. Besides positioning of these deposits is considered with regards to the role of tectonics which is the predominant geological process in the region as observed during the 1999 earthquake sequence of the Marmara region (e.g., Koral, 2007a and b).

2. Material and methods

Samples of the young deposits investigated in this study were obtained from core drillings carried out in early July in 2014 at two different locations, one in the eastern part of the İznik Lake (SK-1)

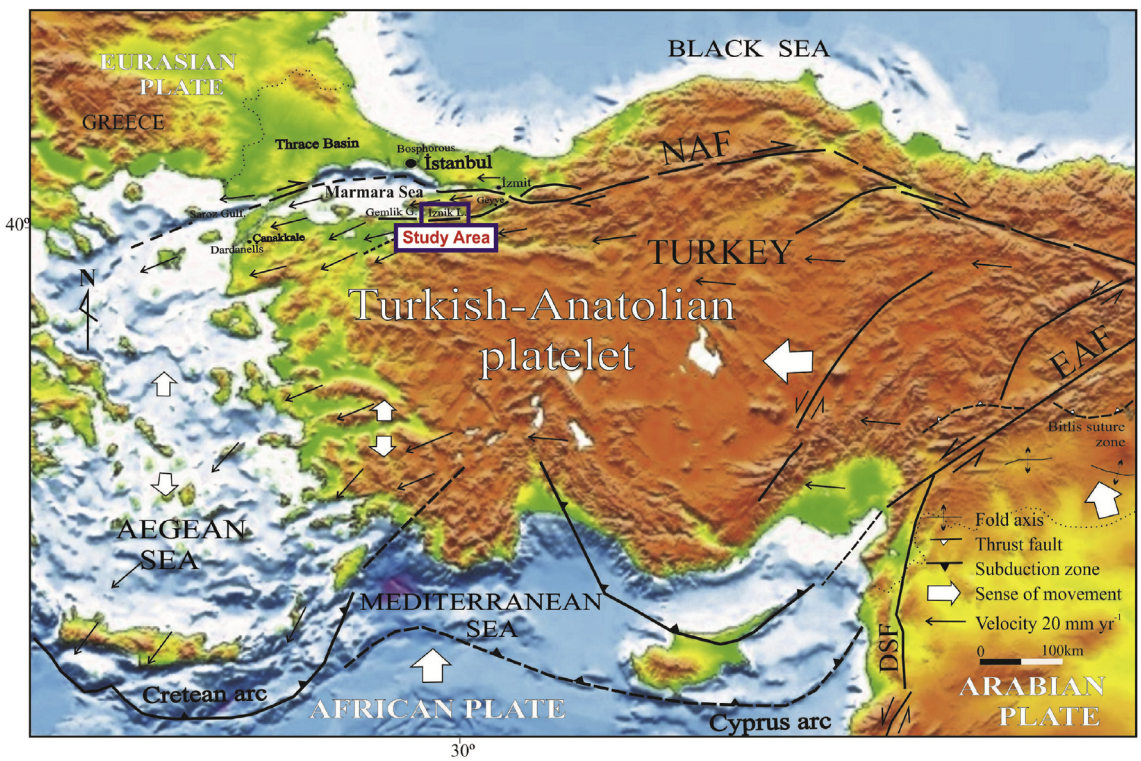

Fig. 1. Morphotectonic features for the Turkish-Anatolian Plate and in particular NW Turkey, where the study area is indicated. Principal tectonic features are taken from McKenzie (1978), Le Pichon and Angelier (1979). Relief map is from Taymaz and Tan (2005). GPS velocity field relative to a Europe-fixed reference as in Straub and Kahle (1994), Reilinger et al. (1997), and Kahle et al. (1998) given by arrows. Bathymmetry of the Marmara Sea reaches down to depths of 1200 m and comprises three deep basins. Each basin is separated from each other by ridges several hundred meters high. The basin is connected to the Black Sea and Aegean Sea through narrow channels, the Bosphorous and the Dardanelles. NAF: North Anatolian Fault; EAF: East Anatolian Fault; DSF: Dead Sea Fault.

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