Palaeogeography, Palaeoclimatology, Palaeoecology 386 (2013) 512–530

Contents lists available at SciVerse ScienceDirect

Palaeogeography, Palaeoclimatology, Palaeoecology

journal homepage: www.elsevier.com/locate/palaeo

Benthic foraminifera as palaeoenvironmental indicators during the last million years in the eastern Mediterranean inner shelf

Simona Avnaim-Katav [a,*], Ahuva Almogi-Labin [b], Amir Sandler [b], Dorit Sivan [a]

[a] Department of Maritime Civilizations and the Leon Recanati Institute for Maritime Studies (RIMS), University of Haifa, Mount Carmel, Haifa 31905, Israel
[b] Geological Survey of Israel, 30 Malkhe Yisrael, Jerusalem 95501, Israel

A R T I C L E I N F O

Article history:
Received 23 March 2013
Received in revised form 11 June 2013
Accepted 12 June 2013
Available online 21 June 2013

Keywords:
Benthic foraminifera
Quaternary
Palaeobathymetry
Inner shelf
Carmel fault
Eastern Mediterranean

A B S T R A C T

Benthic and planktonic foraminifera were studied in inner shelf sedimentary sequences in Haifa Bay, Israel. Three boreholes, taken at water depths from 5 to 14 m, spanning about the last 1 Ma, and a set of modern sediment samples used as modern analogue, were utilized for reconstructing palaeoenvironments and palaeobathymetry. The palaeoenvironmental data were used for assessing tectonic activity of the Carmel Fault, a branch of the Dead Sea transform that bounds the southern side of the bay. Quantitative analyses showed four biofacies: a fresh to brackish wetland environment, and three progressively deepening marine biofacies. Relative water depth ranges were estimated using changes in benthic foraminiferal assemblages, presence or absence of *Ammonia* sp. 1, and the percentage of planktonic foraminifera.

The distribution of the biofacies suggests water depths no deeper than 15 m during most interglacial stages, water depths to 15–40 m during short transgressive phases of MIS 5.5, 7, 11 and 13, and water depth reaching 40–80 m in the earliest transgressive phases (MIS 27? and MIS 29?). The environmental conditions on both sides of the fault were quite similar along the succession. This suggests that the movements of the uplifted and down-faulted blocks have more or less coincided since about 1 Ma.

© 2013 Elsevier B.V. All rights reserved.

1. Introduction

Quaternary inner shelf successions located at the sea-land transition zone would have been frequently affected by glacioeustatic sea-level fluctuations. Sea-level change is reflected by complexity of the depositional successions that include hiatuses during lowstands and palaeoenvironmental changes of the shelf ecosystem during sea-level highs. Foraminifera have proved to be useful in reconstructing such palaeoenvironmental oscillations in shallow marine environments, as the large numbers and diversity enable the group to respond rapidly to changing ecological parameters (e.g. Mendes et al., 2004; Murray, 2006) and their preservation potential is unparalleled.

The most important controls on benthic foraminiferal distribution in the Mediterranean Sea and elsewhere are food availability and dissolved oxygen concentration (e.g. Jorissen et al., 1995; De Rijk et al., 1999, 2000; Murray, 2001). In shallow water environments benthic foraminifera assemblages are influenced by additional factors, including substrate type, temperature and salinity, as for example recorded in the northern Adriatic Sea, eastern Turkey, the southwestern Marmara shelf, western Egypt, and off the Israeli coast (Jorissen, 1988; De Stigter et al., 1998; Basso and Spezzaferri, 2000; Jannink, 2001; Samir et al., 2003; Hyams-Kaphzan et al., 2008; Phipps et al., 2010).

Horton et al. (2007) and Rossi and Horton (2009) showed that the distribution of living benthic foraminiferal assemblages in shallow water is highly correlated to water depth. Water depth, in turn, is connected to substrate type, ratio of siliciclastics to carbonate lithologies (Milker et al., 2009, 2010), oxygen and food availability (Jorissen, 1987; Morigi et al., 2005), or significant changes in salinity, as in deltaic environments (Mendes et al., 2004).

Quantitative analyses of modern microfauna and sedimentological parameters have been used for the palaeobathymetrical and palaeoenvironmental reconstruction of late Quaternary subsurface successions in the central Mediterranean (Rossi and Horton, 2009, and references therein; Carboni et al., 2010, and references therein; Di Bella and Casieri, 2011).

The abundance, diversity, and composition of benthic foraminiferal assemblages in the mixed siliciclastic–carbonate ecosystems of the present southeastern Levantine inner shelf are dependent on substrate types associated with bathymetry and distance from the Nile cone (Hyams-Kaphzan et al., 2008). Hyams-Kaphzan et al. (2008) defined four recent assemblages:

> Assemblage A is dominated by the species *Ammonia parkinsoniana*, *Buccella granulata*, *Pararotalia calcariformata* and some agglutinated taxa. This assemblage is associated with Nilotic siliciclastic sands, south of Haifa Bay.
> Assemblage B is characterized by the species *Ammonia parkinsoniana*, *Ammonia tepida*, *Cribroelphidium poeyanum* and *Porosononion granosum*.

* Corresponding author. Tel./fax: +972 4 8236819.
E-mail address: simona100@bezeqint.net (S. Avnaim-Katav).

0031-0182/$ – see front matter © 2013 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.palaeo.2013.06.019

This assemblage is typical of Nilotic silty clayey sediments, south of Haifa Bay.

Assemblage C is characterized by the species *Amphistegina lobifera* and *Heterostegina depressa* and is associated with rocky substrates in the Levantine carbonate-rich sediments, north of Haifa Bay.

Assemblage D is dominated mainly by *Rosalina macropora*, *Asterigerinata mamilla*, *Peneroplis pertusus* and *Vertebralina striata*. This assemblage is distinctive of carbonate-rich sandy to silty sediments of the northern Levantine shelf.

In this region, foraminiferal assemblage composition has been influenced by the opening of the Suez Canal in the 19th century, when Indo-Pacific "Lessepsian" species invaded the eastern Mediterranean (Por, 1978; Langer and Hottinger, 2000; Hyams et al., 2002). In particular, Assemblage C is highly dominated by Lessepsian invaders. Similar assemblages, but lacking the invaders, have been described in Quaternary coastal sequences along the Israeli shelf (Avital, 2002; Lazar, 2007).

Recent foraminiferal assemblages associated with high and low energy environments were described by Reinhardt et al. (1994) at

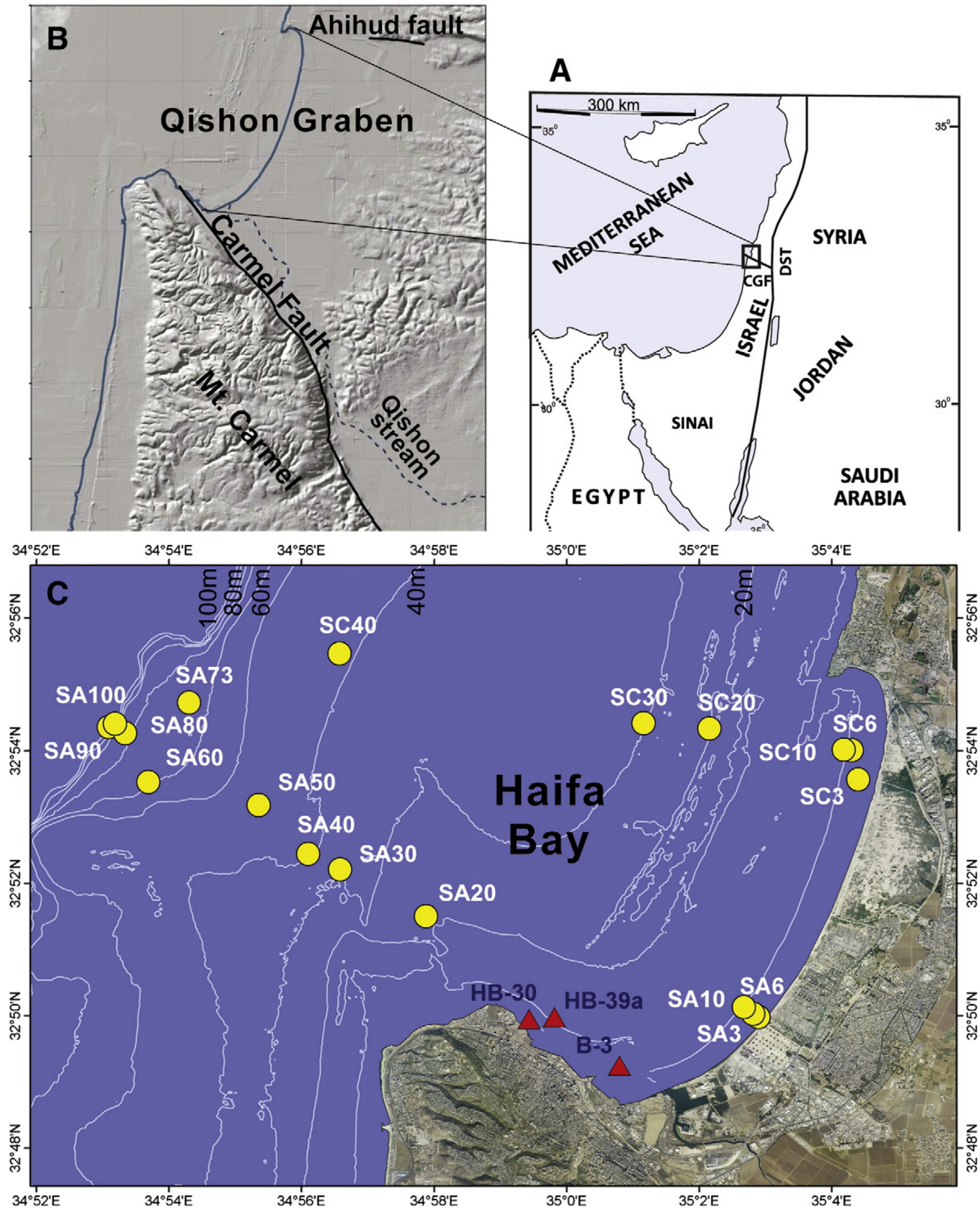

Fig. 1. A. Location of the study area (square) in the eastern Mediterranean, the Dead Sea Transform (DST) and the Carmel–Gilboa Fault (CGF) system following Segev et al. (2006); B. Morphotectonic map of the Qishon Graben and its surroundings bordered by the Carmel Fault (a part of the CGF system) to the southwest and the Ahihud fault to the north; C. Bathymetric map (contours at 10 m step down to 110 m depth following Sade et al., 2006) showing location of the studied boreholes (triangles) and the modern analogue samples in SA and SC transects (circles).

Download English Version:

https://daneshyari.com/en/article/6350353

Download Persian Version:

https://daneshyari.com/article/6350353

Daneshyari.com