Ostracod assemblages from Holocene Middle Shelf Deposits of southern Evoikos Gulf (Central Aegean Sea, Greece) and their palaeoenvironmental implications

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ABSTRACT: The purpose of this study is to collect micropalaeontological evidence concerning the palaeoenvironmental changes that took place at Southern Evoikos Gulf during the Holocene. Southern Evoikos Gulf is a shallow epicontinental basin, at the northern prolongation of the Cycladic Platform (Western Aegean Sea, Greece). The study area of the present research is located at the northern part of this gulf. Two cores, DEH 1 and DEH 5, the sedimentary record of which covers the last 13910 cal. yr B.P., were recovered from 70m and 75.5m water depth respectively and a detailed quantitative and qualitative ostracod analysis is performed in 88 samples of DEH 5 and 56 samples of DEH 1. A total of 45 ostracod species were identified from DEH 1 and 52 species from DEH 5. The distribution of ostracod assemblages in the investigated cores indicates that a restricted shallow oligohaline lagoon was formed sometime before 13540 cal yr BP at the northern basin of the Southern Evoikos Gulf. This closed lagoon existed in the area until 11065 cal yr BP. Subsequently, during the Holocene, an unrestricted communication with the sea was established and a marine coastal environment was formed, with a gradual transition (the beginning of which is estimated at about 8000 cal yr BP in DEH 1) from an infralittoral to a circalittoral one.

Keywords: Ostracoda, Aegean Sea, Quaternary, palaeoecology.

INTRODUCTION

Greece has the longest coastline in the Mediterranean. Consequently, sea-level changes are of great importance for the geographical evolution of the coastal areas. Sea-level changes during the last 18,000 years are a combined outcome of eustatic, isostatic and tectonic movements (Poulos, Ghionis and Maroukian 2009). Furthermore, landlocked and semi-enclosed marine basins are of great interest as their deposits reflect local as well as environmental changes on a greater scale. Valuable information on the palaeoceanographic history of these restricted environments is provided by their benthic microfaunal composition (Drinia and Anastasakis 2012).

The purpose of this study is to contribute with micropalaeontological evidence to the reconstruction of the palaeogeographic evolution of South Evoikos Gulf during Holocene. In particular, the succession of the ostracod assemblages from two sediment cores from the study area i s presented and analyzed herein. Ostracods have long been known to be useful for interpreting palaeoenvironmental conditions. They are one of the most diverse group of crustaceans, inhabiting most of the aquatic environments, sensitive to environmental changes and easily preserved in the sediments (Horne, Cohen and Martens 2002; Cohen et al. 2007). Therefore, they are increasingly used in Quaternary palaeoenvironmental studies.

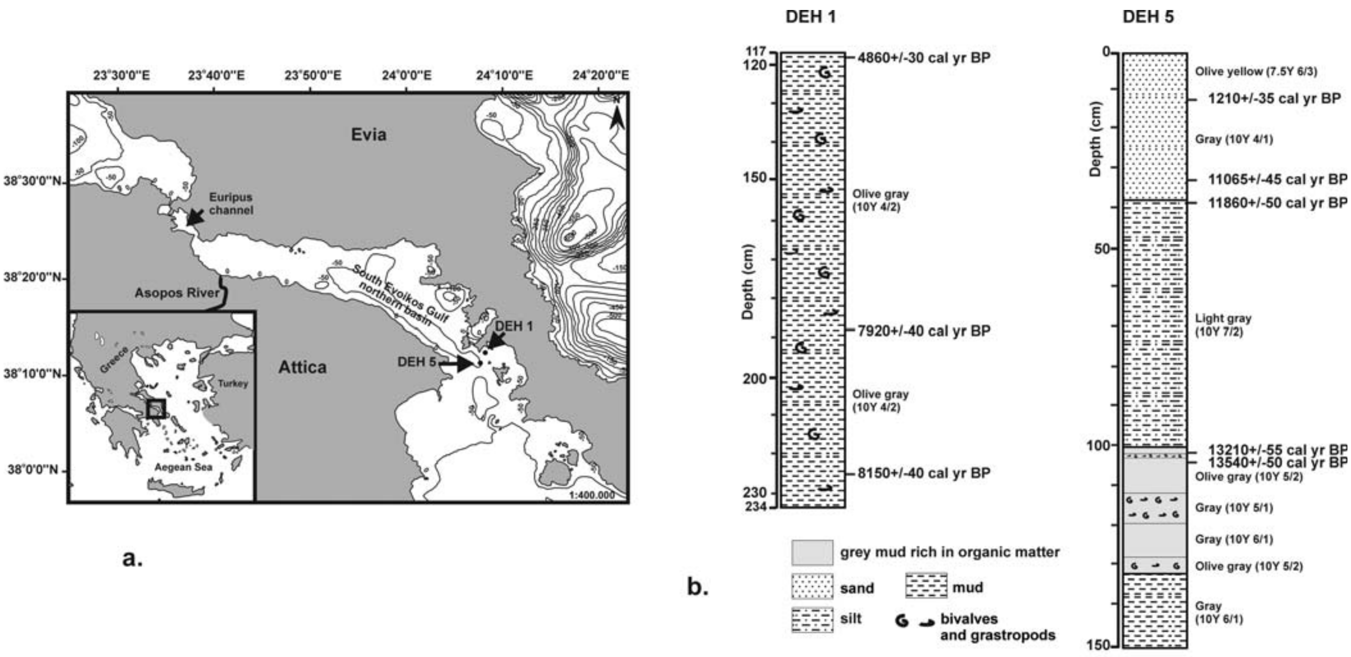
The South Evoikos Gulf (text-fig. 1a) is one of several Neogene basins that subsided since the Miocene in central Greece (Anastasakis et al. 2006). In particular, it is a shallow tectonic epicontinental basin (a graben trending WNW-ESE to NW-SE) in the back-arc area at the northern prolongation of the Cycladic Platform (Papanikolaou et al. 1988). The gulf separates Attica from Southern Evia and it is divided into two sub-basins: a northern shallow one where water depths range from 20 to 70m, the coastal zone is steep and the sea floor is flat, and a southern deeper basin with a maximum depth of 162m (Papanikolaou et al. 1988; Karageorgis et al. 1997; Karageorgis et al. 2000). Furthermore, South Evoikos is characterized as an area of low seismicity, due to low tectonic activity (Drakopoulos, Makropoulos and Stavrakakis 1984).

The hydrographic network of the area is characterized by Asopos river and some other ephemeral streams. The tidal flux through the Eurypus Strait, which induces significant sea-level fluctuations, does not affect South Evoikos Gulf, the tides of which are due to the incoming tide from the Aegean Sea through the south opening (Tsimplis 1997).

The study area of the present research is located at the northern landlocked, shallow basin of South Evoikos gulf (text-fig. 1a).

MATERIALS AND METHODS

Two sediment cores were selected for the purposes of the current study: DEH 1 (N 38° 12' 23.1228", E 24° 8' 14.2404") with a total length of 234cm, from which the portion between 117 to 234cm was available for micropalaeontological analysis, and DEH 5 (N38°11' 19.3992", E24°7' 46.9488") with a total length of 150cm. They were recovered with a benthos gravity corer



TEXT-FIGURE 1
a. Location map and position of the studied sediment cores. b. Lithostratigraphic columns of the sediment cores DEH 1 and DEH 5 and the AMS 14C datings.

from 70m and 75.5m water depth respectively. A brief lithological description of the cores is presented in text-figure 1b.

Radiocarbon dating demonstrated that these two cores cover a sedimentary record of more than 13540 cal. yr B.P. (text-fig. 1b). Three radiocarbon dates were carried out on the layers 117-120cm, 187-189cm and 224-226cm for DEH 1, by AMS method at "Beta Analytic Inc.", Miami, Florida, USA. Additionally, five radiocarbon dates were carried out by AMS method at "Beta Analytic Inc." for DEH 5 on the layers 12-13cm, 32-33cm, 38-39cm, 102-103cm and 103-104cm.

Regarding micropalaeontological analysis, a detailed quantitative and qualitative ostracodological analysis was performed on 56 samples from DEH 1 and 88 samples from DEH 5. A fraction of 20gr (dry weight) from each sample was wet sieved and dried. All ostracods were collected from the fraction > 125 m (Appendix 1, 2).

Ostracods were determined to the species level by using stereomicroscope and Scanning Electron Microscope (Jeol JSM 5600). Taxonomy was based on Horne et al. (2002) and the identification of ostracod species was based on several publications, as shown in Table 1.

Concerning quantitative analysis, Microsoft Excel 2007 and Grapher 4 were used in order to calculate the relative abundances of each species in every sample and to construct distribution diagrams per borehole for the most abundant taxa (text-fig. 2). Furthermore, four community structure indices were calculated using PAST ver. 2.12 (Hammer et al. 2001), based on the absolute abundances of the ostracod species (Appendix 3): the number of taxa in each sample, dominance (D) and two diversity indices (Shannon-Wiener [H(s)] and Fischer alpha [S']).

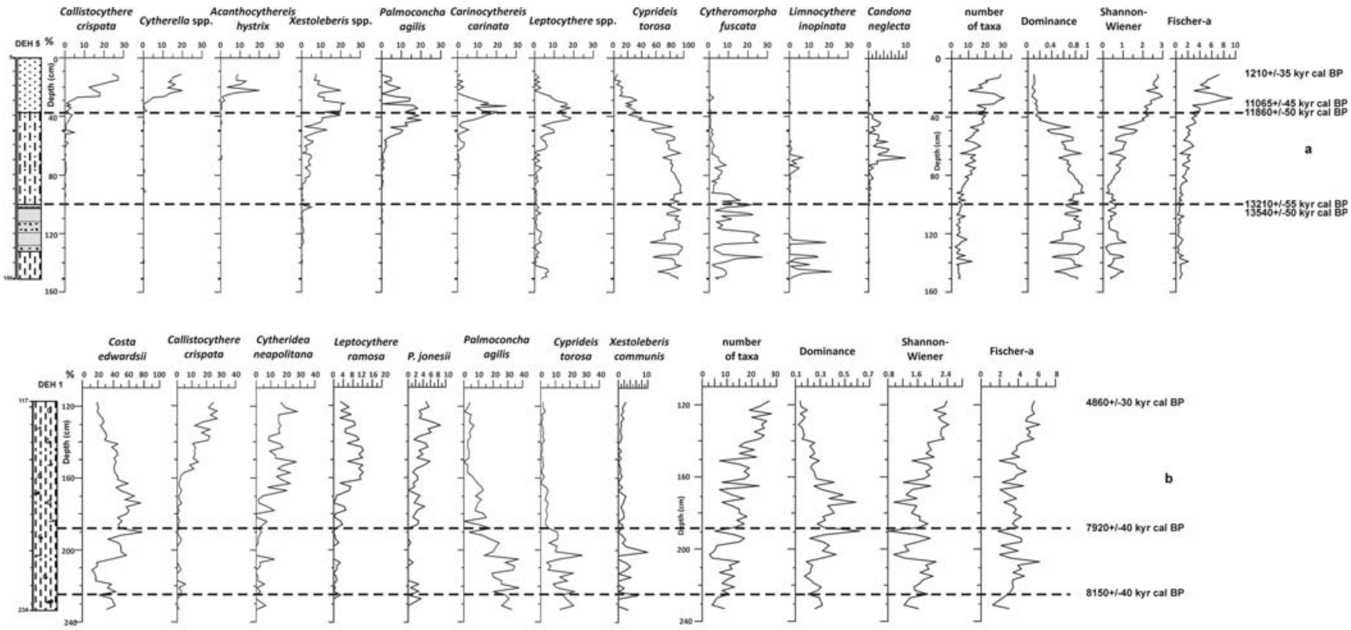
RESULTS

Core DEH 5

The sediment core DEH 5 covers a time span of more than 13540+/-50 cal yr BP (text-fig. 1b) and, on the whole, bore an ostracod fauna of 52 species. The changes in the composition of the ostracod assemblages along the core follow the lithological changes (Plate 1, Fig. 2a, Appendix 2).

The bottom interval at 150-100cm comprises the finest sediments of the core, that is, mud (150-142cm) and grey mud rich in organic matter (142-100cm). Ostracod assemblages are characterized by the great abundance of *Cyprideis torosa* (Jones 1850) (52.05-97.24%), accompanied mainly by *Cytheromorpha fuscata* (Brady 1869) (1.72-27.33%), *Limnocythere inopinata* (Baird 1843) (0-21.58%) and *Leptocythere rara* (Müller 1894) (0-7.19%).

The middle part of the core (100-40cm) is made of light gray silt. *C. torosa* is the dominant ostracod in the assemblages with percentages up to 97.06%, but it tends to decline towards the uppermost part of this unit. The accompanying fauna for the interval 100-60cm is composed of *C. fuscata* (1.16-16.10%), *L. inopinata* (0-6.71%), *Candona neglecta* Sars 1887 (0-9.76%), *Leptocythere* spp. (0-6.55%) (mainly *Leptocythere lagunae* Hartmann 1958 and *L. rara*) and *Xestoleberis* spp. (0-4.88%) (mainly *Xestoleberis fuscomaculata* Müller 1894). In the upper part of this interval (60-40cm) the main accompanying taxa are *Leptocythere* spp. (3.2-18.49%) with *L. lagunae*, *L. rara* and *Leptocythere ramosa* (Rome 1942), *Xestoleberis* spp. (1.51-12.93%) (mainly *Xestoleberis communis* Müller 1894 and *X. fuscomaculata*) and *Palmoconcha agilis* (Ruggieri 1967) (1.39-20.11%).



TEXT-FIGURE 2
Frequencies of the most abundant species and curves of the calculated community structure indices of the ostracod assemblages in the studied samples for a. core DEH 5 and b. core DEH 1.

Consequently, *C. torosa* is typical of the largest part of DEH 5 (150-40cm) and it is present in extremely high numbers of specimens in the studied samples. Furthermore, several specimens have noded carapaces. Noded valves are frequent in the levels where *C. torosa* is accompanied by high frequencies of *L. inopinata* or/and *C. neglecta*.

Ostracod populations throughout the interval 150-40cm of the core are well represented by valves of adult individuals, juveniles of different stages as well as few complete carapaces.

Finally, the upper part of the core (40-0cm) is sandy and there is sedimentological evidence of reworking in a high energy environment. It is characterized by radical changes in the faunal composition. Namely, the interval 40-27cm is marked by the rapid decrease in the absolute and relative abundance of *C. torosa*. Ostracod fauna is composed mainly of *Carinocythereis carinata* (Roemer 1838) (5.79-25%), *Xestoleberis* species (11.14-21.79%) (mainly *X. fuscomaculata* and *X. communis*), *Palmoconcha agilis* (11.88-18.96%) and *Leptocythere* spp. (8.26-18.28%) (*L. lagunae*, *L. rara* and *L. ramosa*).

The most abundant species for this interval are well represented by valves of adult and juvenile individuals, while complete carapaces are rare. Additionally, *C. torosa* is present at the bottom of this interval with both adult and juvenile individuals, while towards the top is represented only by juveniles.

The most abundant species in the uppermost part (0-27cm) are *Callistocythere crispata* (Brady 1868) (12.50-27.42%), *Cytherella* spp. (11.11-20%) (*Cytherella vulgata* Ruggieri 1962 and *Cytherella scutulum* Ruggieri 1976) and *Acanthocythereis hystrix* (Reuss 1850) (1.39-20%). The accompanying fauna includes *Semicytherura* spp. (2.60-9.38%), *Xestoleberis* species (6.45-20%) (*X. fuscomaculata* and *X. communis*), *P. agilis* (0-9.38%), *Cytheridea neapolitana* Kollmann 1960 (0-6.45%) and *Cytheropteron* spp. (0-6.25%).

The most abundant species for this interval are represented by valves of adult and juvenile individuals of different stages, while complete carapaces are rare. The accompanying fauna is represented by valves of adults and juveniles of the last instars. *Cytheropteron* spp. are represented only by juveniles.

As regards the community structure indices, the number of taxa and the Diversity indices (Shannon-Wiener and Fischer-a) significantly increase towards the top of the studied core, while the Dominance index shows its higher values in the lower and intermediate part of the core (text-fig. 2a, Appendix 3).

Core DEH 1

Core DEH 1 is made entirely of olive gray mud. The part of the core analyzed herein (117-234cm) represents a sedimentary record from about 8150 cal yr BP to 4860 cal yr BP (text-fig. 1b). A total of 45 ostracod species was identified and different ostracod assemblages alternate along the core (Plate 1, Fig. 2b, Appendix 1).

Ostracod assemblages in the lower part of the core (234-200cm) consist mainly of *Costa edwardsii* (Roemer 1838) (15.38-57.14%), *Palmoconcha agilis* (14.29-41.54%), *Cyprideis torosa* (4.84-30.43%), *Xestoleberis* spp. (mainly *X. communis*, 0-10%), and *Sagmatocythere versicolor* (Müller, 1894) (0-6.5%). A low number of specimens (usually less than 100 valves per sample) are typical of the assemblages.

In the middle part (200cm-160cm), *Costa edwardsii* is the dominant species with relative abundances up to 78% of the total

TABLE 1
Ostracod species reference list, in alphabetical order.

Identified species	DEH1	DEH5	
Acanthocythereis hystrix **(Reuss)**		x	*Cypridina hystrix* n. sp. Reuss, 1850, p. 74, Pl. 10: Fig. 6; *Acanthocythereis hystrix* (Reuss), Athersuch, 1979a, p. 133–140; Stambolidis, 1984, p. 65, pl. II: Figs. 8–9.
Aurila convexa **(Baird)**		x	*Cythere convexa* n. sp. Baird, 1850, Pl. 21: Fig. 3; *Aurila convexa* (Baird), Bonaduce et al., 1975, p. 43, Pl. 21: Figs. 1–7; Stambolidis, 1984, p. 88, Pl. 4: Fig. 7.
Aurila **sp.**	x		
Bosquetina dentata **(Müller)**	x	x	*Cythereis dentata* n. sp. Müller, 1894, p. 379, pl. 32, figs. 23, 27, 31; *Bosquetina dentata* (Müller), Athersuch, 1979, Fig. 18; Hajjaji et al. 1998, Pl. 2, Fig. 17.
Buntonia sublatissima **(Neviani)**	x	x	*Cythere sublatissima* n. sp. Neviani, 1906, p. 198, fig. 8; *Buntonia sublatissima* (Neviani), Bonaduce *et. al*., 1975, p. 55, pl. 33: fig. 6-11; Ertekin & Tunoglu, 2008, p. 318-319, pl. 4, figs. 3, 6.
Callistocythere crispata **(Brady)**	x	x	*Cythere crispata* n, sp. Brady, 1868, p. 221, Pl. 14: Figs. 14–15; *Callistocythere crispata* (Brady), Barbeito-Gonzalez, 1971, Pl. 10: Figs. 1a–3a; Athersuch & Whittaker, 1980, p. 67–72.
Candona neglecta **Sars**		x	*Candona neglecta* n.sp. Sars, 1887, pl. 15, figs 5-7, pl. 19; Meisch, 2000, p. 77-81, figs 26-27.
Candona **sp.**	x		
Carinocythereis carinata **(Roemer)**	x	x	*Cytherina carinata* n. sp. Roemer, 1838, pl. 6, fig. 28; *Carinocythereis carinata* (Roemer), Athersuch & Whittaker, 1987, 97-102.
Caudites calceolatus **(Costa)**	x		*Cytherina calceolata* n. sp. Costa, 1853, p. 185, pl. 16: fig. 14; *Caudites calceolatus* (Costa), Bonaduce et. al., 1975, pl. 26: fig. 10-13; Tsapralis, 1981, pl. 2: fig. 1-2.
Costa edwardsii **(Roemer)**	x	x	*Cytherina edwardsii* n. sp. Roemer, 1838, p. 518, pl. 6, fig. 27; *Costa edwardsii* (Roemer), Doruk, 1973, p. 245-248.
Cyprideis torosa **(Jones)**	x	x	*Candona torosa* n. sp. Jones, 1850, p. 27, pl. 3: fig. 6; *Cyprideis torosa* (Jones), Wagner, 1957, p. 39, pl. 14; Tsapralis, 1981, p. 89, pl. 3: fig. 3, 4; Athersuch et al. 1989, p 114-115, text-fig. 44, pl. 3: fig. 1-2.
Cyprinotus **sp.**	x	x	
Cytherella scutulum **Ruggieri**	x	x	*Cytherella scutulum* n. sp. Ruggieri, 1976, p. 95-96, pl. 6; Aiello et al., 1996, p. 185-186, pl. 5, figs 6, 9, 11, 12.
Cytherella vulgata **Ruggieri**	x	x	*Cytherella vulgata* n. sp. Ruggieri, 1962, p. 9-10, Pl. 1, figs 9-10; Aiello et al., 1996, p. 186-187, pl. 3, figs 2, 4, 5.
Cytheretta **sp.**	x	x	
Cytheridea neapolitana **Kollmann**	x	x	*Cytheridea neapolitana* n. sp. Kollmann, 1960, p. 152, Pl 7: Figs. 7–10, Text-Figs. 3a–c; Bonaduce et. al., 1975, p. 60, pl. 34: fig. 6-7; Stambolidis, 1984, p. 58, Pl. 2: Fig. 4; Guernet et al., 2003, p. 81, pl. 1, fig. 17-18.
Cytheromorpha fuscata **(Brady)**		x	*Cythere fuscata* n. sp. Brady, 1869, p. 47, pl. 7, figs 5-8; *Cytheromorpha fuscata* (Brady), Sars, 1925, p. 177-178, pl. 81; Boomer & Horne, 1991, p. 49-56
Cytheropteron **spp.**	x	x	
Echinocythereis **sp.**	x		
Eucythere **sp.**		x	
Eucytherura complexa **(Brady)**	x	x	*Cythere complexa* n. sp. Brady, 1866b, p. 210; *Eucytherura complexa* (Brady), Tsapralis, 1981, p. 105, Pl. 8, Fig. 8.
Eucytherura mistrettai **Sissingh**	x	x	*Eucytherura mistrettai* n. nom. Sissingh, 1972, p. 140; Tsapralis, 1981, p. 105, Pl. 9, Fig. 1.
Hemicytherura gracilicosta **Ruggieri**	x	x	*Hemicytherura gracilicosta* n. sp. Ruggieri, 1953, p. 50, Figs. 5a, b, 7; Bonaduce et al., 1975, Pl. 47: Fig. 10; Barbeito-Gonzalez, 1971, Pl. 26: Figs. 1a–3a.
Hiltermannicythere turbida **(Müller)**	x	x	*Cythereis turbida* n. sp., Müller, 1894, p. 371–372, Pl. 28, Figs. 22, 27, Pl. 31, Fig. 7; *Hiltermannicythere turbida* (Müller), Athersuch, 1979, Fig. 2: 13; Guernet et al., 2003, p. 84, pl. 2, fig. 6.
Ilyocypris **sp.**		x	
Krithe **sp.**	x		
Leptocythere lagunae **Hartmann**		x	*Leptocythere lagunae* n. sp. Hartmann, 1958, p. 226, pl. 34: fig. 105; Bonaduce et. al., 1975, p. 31, pl. 15: fig. 1-9, text-fig.10, 11; Stambolidis, 1984, p. 44.
Leptocythere ramosa **(Rome)**	x	x	*Cythere ramosa* n. sp. Rome, 1942, p. 22–23, Pl. 4, Fig. 52 ; Pl. 5, Figs. 53, 54 ; Pl. 6, Fig. 51; *Leptocythere ramosa* (Rome), Tsapralis, 1981, p. 86, Pl. 5, Fig. 2; Hajjaji et al. 1998, Pl. 2, Fig. 20; Guernet et al., 2003, p. 78-79, pl. 1, fig. 3-4; Faranda and Gliozzi, 2008, pl. 2, fig. 10-12.
Leptocythere rara **(Müller)**	x	x	*Cythere rara* n. sp. Müller, 1894, p. 355, pl. 27 fig. 32, pl. 29 figs 12,14; *Leptocythere rara* (Müller), Bonaduce et al., 1975, p. 34-35, pl. 15 figs 10-14, text figs 17-18; Lachenal, 1989, p. 149, pl. 3: fig. 8.
Limnocythere inopinata **(Baird)**		x	*Cythere inopinata* n. sp. Baird, 1843, Zoologist, 1, p. 195; *Limnocythere inopinata* Meisch, 2000, p. 427-432, figs 14B, 175, 176(A-D).
Loxocauda decipiens **(Müller)**	x	x	*Loxoconcha decipiens* n. sp. Müller, 1894, p. 347, Pl. 27: Figs. 10–14, 24; Pl. 29, Figs. 2, 9; *Loxocauda decipiens* Müller, Bonaduce et al., 1975, Pl. 14: Fig. 11; Lachenal, 1989, Pl. 2: Fig. 10.
Loxoconcha alata **Brady**	x		*Loxoconcha alata* n. sp. Brady, 1868, p. 223, Pl. 14: Figs. 8–13; Uffenorde, 1972, p. 82, Pl. 9: Fig. 1; Athersuch, 1977, p. 99–106.
Loxoconcha affinis **(Brady)**	x		*Normania affinis* n. sp. G.S. Brady, 1866a, p. 382, pl. 61: figs. 12a-d; *Loxoconcha affinis* (Brady): Athersuch, 1976b, p. 91-98.
Loxoconcha elliptica **Brady**		x	*Loxoconcha elliptica* n. sp. Brady, 1868, p. 435, pl. 27: fig. 38, 39, 45, 48; Athersuch & Whittaker, 1976, p. 99-106.
Loxoconcha ovulata **(Costa)**		x	*Cytherina ovulata* n. sp. Costa, 1863, p. 181, Pl. 16: Fig. 7; *Loxoconcha ovulata* (Costa), Barbeito-Gonzalez, 1971, p. 307, Pl. 32: Figs. 1b–4b; Athersuch, 1979b, p. 141–150.
Loxoconcha rubritincta **Ruggieri**			*Loxoconcha rubritincta* n. sp. Ruggieri, 1964, p. 521, pl. 63: fig. 8-11; Barbeito-Gonzalez, 1971, p. 308, pl. 32: fig. 1c-4c; Athersuch, 1976a, p. 107-116.
Loxoconcha **sp.**		x	
Monoceratina meditteranea **Sissingh**	x	x	*Monoceratina meditteranea* n. sp. Sissingh, 1972, p. 152-153, pl. 12, figs 13-14; Ertekin & Tunoglu, 2008, p. 322, pl. 4, fig. 9.
Palmoconcha agilis **(Ruggieri)**	x	x	*Loxoconcha agilis* n. sp. Ruggieri, 1967, p. 377, Pl. 37, fig. 6, text-figs 442-446; *Palmoconcha agilis* (Ruggieri); Boomer et al., 2010, p. 130, Pl. 2, fig. 11
Paracytheridea depressa **Müller**	x	x	*Paracytheridea depressa* n.sp. Müller, 1894, p.341, Pl.29: fig.4; Yassini, 1979, p. 386, pl. 9, figs 1, 4, 5.
Paradoxostoma **spp.**	x	x	

TABLE 1
continued.

Identified species	DEH1	DEH5	
Propontocypris **sp.**	x	x	
Pterygocythereis jonesii **(Baird)**	x	x	*Cythereis jonesi* n. sp. Baird, 1850, p. 175, Pl. 20: Fig. 1; *Pterygocythereis jonesi* (Baird), Athersuch, 1978, p. 9–16; Stambolidis, 1984, p. 84, pl. 4: figs. 8–9.
Sagmatocythere versicolor **(Müller)**	x	x	*Loxoconcha versicolor* n. sp. Müller, 1894, p. 346, pl. 27: fig. 4; pl. 28: figs 5, 10; *Sagmatocythere versicolor* (Müller), Guernet et al., 2003, p. 86-87, pl. 2, fig. 13; Faranda & Gliozzi, 2008, pl. 9, fig. 13.
Semicytherura acuta **(Müller)**	x	x	*Cytherura nigrescens* n. sp. Müller, 1894, p. 290, pl. 18: figs 3, 11, 14; pl. 19: fig. 14; *Cytherura acuta* n. nom. Müller, 1912, p. 264; Bonaduce et al., 1975, p. 68-69, pl. 41: fig. 4-5.
Semicytherura alifera **(Ruggieri)**	x	x	*Cytherura alata* n. sp. Müller, 1894, p. 288, pl. 18: figs 1, 7, 8; pl. 19: fig. 9; *Semicytherura alifera* n. nom. Ruggieri, 1959, p. 204; Bonaduce et al., 1975, p. 68-69, pl. 41: fig. 4-5.
Semicytherura incongruens **(Müller)**	x	x	*Cytherura incogruens* n. sp. Müller, 1894, p. 296, pl. 17: fig. 2, 7, 8, pl. 19: fig. 7; *Semicytherura incogruens* (Müller), Doruk, 1974, p. 105-112.
Semicytherura inversa **(Seguenza)**	x	x	*Cytherura inversa* n. sp. Seguenza, 1880, p. 365, Pl. 17, figs. 51, 51a; *Semicytherura inversa* (Seguenza), Bonaduce et al., 1975, p. 72-73, pl. 42: fig. 1-5; Faranda and Gliozzi, 2008, p. 248, pl. 10, fig. 14.
Semicytherura paradoxa **(Müller)**	x	x	*Cytherura paradoxa* n. sp. Müller, 1894, p. 294, pl. 17: figs 3, 9; pl. 19: fig. 12; Bonaduce *et al.*, 1975, p. 74-75, pl. 44: fig. 1-2; Tsourou, 2012, pl. 2, fig. 4.
Semicytherura ruggierii **(Pucci)**	x	x	*Cytherura ruggierii* n. sp. Pucci, 1956, p. 167, pl. 1, figs. 3, 4, textfig. 1; Bonaduce et al., 1975, p. 79, pl. 38: fig. 1-10; Yassini, 1979, p. 384, pl. 8, figs 9-11.
Semicytherura **sp.**	x	x	
Tetracytherura angulosa **(Seguenza)**		x	*Cytheridea angulosa* n. sp. Seguenza, 1880, p. 363, pl. 17: figs 47, 47a; *Tetracytherura angulosa* (Seguenza), Tsapralis, 1981, p. 85, Pl. 10, Fig. 3.
Triebelina **sp.**	x	x	
Urocythereis **sp.**	x	x	
Xestoleberis communis **Müller**	x	x	*Xestoleberis communis* n. sp. Müller, 1894, p. 338, pl. 25: fig. 32, 33, 39; pl. 26: fig. 1, 6; Barbeito-Gonzalez, 1971, pl.39: fig. 1d- 3b; Athersuch, 1976, p. 293, pl.11: fig.4, pl.12: figs.1-4.
Xestoleberis decipiens **Müller**		x	*Xestoleberis decipiens* n. sp. Müller, 1894, p. 337, Pl. 25: Fig. 10, Pl. 26: Fig. 4, 8; Barbeito-Gonzalez, P. J., 1971, Pl. XL: Figs. 1b, 2b.
Xestoleberis fuscomaculata **Müller**	x	x	*Xestoleberis fuscomaculata* n. sp. Müller, 1894, p. 337, Pl. 25: Fig. 41, 52, Pl. 26: Fig. 3; Athersuch, 1976, p. 296, pl.13: fig.1-4, pl.17: figs. 4, 6, 12, 14, 15; Hajjaji et al. 1998, Pl. 3, Fig. 1.
Xestoleberis parva **Müller**		x	*Xestoleberis parva* n. sp. Müller, 1894, p.333, pl.25: fig.1, 7, 8, 18-24, 31, 36, pl.26: fig.4; Bonaduce & Danielopol (1988), text.-fig.2: G.; Triantaphyllou et al. (2005), Pl. 3, fig. 6.
Xestoleberis **sp.**	x	x	

ostracod fauna. The accompanying fauna consists of *P. agilis* (3.70-35.76%), *C. torosa* (0-12.96%), both present with decreasing relative abundances towards the top of this interval, *Cytheridea neapolitana* (0-23.29%) and *Leptocythere ramosa* (0-11.41%) which display increased relative abundances.

In the upper part of the core (160cm-117cm) ostracod assemblages are composed of *Costa edwardsii* (18.79-46.59%), *C. neapolitana* (8.44-27.81%), *Callistocythere crispata* (2.76-27.44%), *Pterygocythereis jonesii* (Baird 1850) (1.29-8.66%) and *Leptocythere* spp. (2.87-12.33%) mainly with *L. ramosa*. The frequency of *C. edwardsii* decreases towards the upper part of the core, while *C. crispata*, *C. neapolitana* and *P. jonesii* show the opposite trend. The accompanying fauna consists mainly of *P. agilis* (0.59-7.22%), *S. versicolor* (1-4.26%) and *Xestoleberis* species (1-5.57%) mainly with *X. fuscomaculata*.

Ostracod populations throughout the core are represented by valves of adult individuals as well as juveniles of different stages, while complete carapaces are rare. However, *C. torosa* is represented almost entirely by juveniles, especially in the upper part of the core designating transportation, thus it is considered as allochthonous species.

As far as the community structure indices are concerned, the number of taxa and Diversity indices increase towards the top of the studied core, while the Dominance index displays its higher values in the middle part of the core due to the high abundance of *C. edwardsii* (text-fig. 2b, Appendix 3).

DISCUSSION

Environmental interpretation

Distribution patterns of the identified ostracod assemblages reflect different depositional environments that alternate along the cores.

Core DEH 5

In particular, the following palaeoenvironmental succession was recognized through core DEH 5:

Interval 150-100cm (older than 13540+/-50 cal yr BP) - The great abundance of *C. torosa* is characteristic of this interval. This species is typically abundant or dominant in the assemblages from all the transitional environments among fresh, brackish and marine environments (Carbonel 1982; Ruiz et al. 2006). *C. torosa* is considered as a species preferring low energy waters (Carbonel 1980; Ruiz et al. 2000) and it is a euryhaline species showing adaptability to salinities from 0.4‰ to 150‰ (Neale 1988). However, it is primarily associated with areas of lowered salinity (Athersuch 1979) and it occurs in dense populations when salinity ranges between 2-17‰ (Morkhoven 1962). It occurs in shallow (<30m) marginal marine environments like lagoons and estuaries (Athersuch, Horne and Whittaker 1989).

Regarding the accompanying species, *C. fuscata* is a fresh to brackish water (0.5-20‰) species (Boomer and Horne 1991), typical in brackish faunas dominated by *C. torosa* (Viehberg et al. 2008). *L. inopinata* inhabits mainly shallow, fresh to oligohaline water bodies like ponds, swamps, lakes, streams, and rivers, but it is also found in oligohaline inland coastal waters (Meisch 2000). Finally, *L. rara* is a shallow littoral marine species (Lachenal 1989; Amorosi et al. 1999; Bracone et al. 2012), also present in brackish waters (Gliozzi et al. 2005; Ruiz et al. 2006).

Additionally, an important feature of *C. torosa* is that in very low salinities it develops nodes on the valves (Keyser 2005; Frenzel, Schulze and Pint 2012), so the fact that noded valves are present in significant numbers in the levels where *C. torosa* is accompanied by abundant *L. inopinata*, indicates significant low salinity below 8 psu. Consequently, the ostracod assemblages recovered in the lower interval of DEH 5 sediment core depict a low energy restricted, shallow (<30m) and oligohaline environment.

Interval 100-40cm (from 13540 to 11860 cal yr BP) - Also in this part of the core *C. torosa* is the dominant species. For the largest part of this interval (100-60cm) it is accompanied, alternatively, either by oligohaline or brackish (mesohaline) marine species. The oligohaline assemblage is composed of *C. fuscata, L. inopinata* and *C. neglecta*. *C. neglecta* is a freshwater species and occurs in temporary and permanent water bodies (Meisch 2000), but it is also reported from inland and coastal oligohaline brackish waters (Pavlopoulos et al. 2006; Mazzini et al. 2011). Furthermore, when accompanied by oligohaline fauna, *C. torosa* is present with noded specimens. The mesohaline assemblage includes *L. lagunae*, *L. rara* and *Xestoleberis* spp. mainly with *X. fuscomaculata*. *L. lagunae* is considered a marine brackish dweller, characterizing shallow mesohaline lagoons (Mazzini et al. 1999; Carboni et al. 2002; Ruiz et al. 2006). The recovered *Xestoleberis* species are abundant in shallow marine environments although a few are known from the deep sea (Athersuch, Horne and Whittaker 1989) and they are highly associated with algae (Athersuch 1976; Cronin et al. 2001). Additionally, some *Xestoleberis* species tolerate salinity fluctuations and are known from brackish marine environments such as lagoons with subaquatic vegetation (Mazzini et al. 1999; Cronin et al. 2001; Viehberg et al. 2008). *X. fuscomaculata*, in particular, is a coastal marine species highly connected with algae (Athersuch 1979) and it is also found in marine lagoonal environments (Marriner et al. 2012).

Finally, at 60-40cm of depth, *C. torosa* is accompanied by mesohaline to shallow marine species: *L. lagunae*, *L. rara*, *L. ramosa*, *X. communis*, *X. fuscomaculata* and *P. agilis*.

L. ramosa as well as *L. lagunae* and *L. rara*, can be found in brackish mesohaline lagoonal environments (Carboni et al. 2002; Gliozzi et al. 2005). *X. communis* is a marine species widely distributed throughout the Mediterranean. It has been reported up to a depth of 125m (Bonaduce, Ciampo, Masoli 1975), but it is usually found in very shallow marginal marine environments. Furthermore, it is a polyhaline to euhaline species associated with both sediment and phytal (algae and macrophytes) substrates (Athersuch 1979; Lachenal 1989; Tsourou 2012) and it often occurs in brackish lagoonal environments (Ruiz et al. 2006; Triantaphyllou et al. 2010; Marriner et al. 2012). *P. agilis* is a shallow coastal marine species (Boomer, Guichard and Lericolais 2010).

Concluding, the sediment record for this time interval represents a closed lagoonal shallow environment with macrophytic cover. Salinity fluctuations pointing to an oligohaline or a mesohaline environments are evident by the alternation of the above mentioned assemblages along the core. Gradually towards the top, mesohaline conditions are established.

Interval 0-40cm (from 11065 cal yr BP to Present) - This is the coarser part of the core and there is sedimentological evidence of reworking, therefore a high energy environment is indicated where sediment displacement took place. In this framework, ostracod assemblages could be considered as transported, however, the populations' age structure of the most abundant species suggests that they came from a nearby environment. Summarizing, although there is not a continuous record of the Holocene in this interval of the core, ostracod assemblages reflect significant environmental change.

In the interval 40-27cm, the ostracod fauna is composed mainly of the marine to mesohaline species of *X. fuscomaculata* and *X. communis* and *Leptocythere* spp. (*L. lagunae*, *L. rara* and *L. ramosa*) and the marine taxa *P. agilis* and *C. carinata*. *C. carinata* is a typical broadly distributed infralittoral to shallow circalittoral species (Athersuch, Horne and Whittaker 1989; Mostafawi and Matzke-Karasz 2006; Ruiz et al. 2008). Namely, *C. torosa* brackish assemblages are displaced by marine ones, pointing to a transition from a lagoonal to an open marine infralittoral depositional environment. *C. torosa* is considered here as an allochthonous species and the population age structure in the bottom of this interval suggests that it was transported from a nearby environment, probably from an inner part of the Southern Evoikos basin.

The ostracod assemblages at the uppermost part of the record (0-27cm) are composed of mixed faunas. The most abundant species are *C. crispata*, *C. scutulum, C. vulgata* and *A. hystrix*, all species indicative of the outer infralittoral-inner - circalittoral zone (Bonaduce, Ciampo, Masoli 1975; Tsapralis 1981; Hajjaji et al. 1998; Guernet et al. 2003; Faranda et al. 2008; Ruiz et al. 2008; Tsourou 2012). The populations' age structure suggests minor or no transportation. The accompanying species point to a shallower environment as *Semicytherura* spp., *X. communis, X. fuscomaculata*, *C. neapolitana* are common in the infralittoral zone (Bonaduce, Ciampo, Masoli 1975; Tsapralis 1981; Guernet et al. 2003; Tsourou 2012; Bracone et al. 2012; Aiello et al. 2012). Additionally, *Cytheropteron* species are common in the circalittoral and bathyal zones (Dall'Antonia 2003; Bracone et al. 2012) and herein are considered transported from deeper environments as they are present only with juveniles. Consequently, the synthesis of these assemblages indicates a depositional marine environment of high energy, less than 70m, in the circalittoral zone.

Concluding, it seems that after 11065 cal yr BP sea level rise led to the sea intrusion into the restricted lagoon which was previously formed in Southern Evoikos gulf. This intrusion took place probably through a channel at the south of this Gulf. DEH 5 is located in the edge of South Evoikos basin and in the middle of the southern opening of the gulf. The position of this core probably explains the high energy environment and the faunal displacement reflected in its upper part.

Core DEH 1

The analyzed portion of the sedimentary record of core DEH 1 corresponds to the upper part of DEH 5 (0-40cm) and to the time interval during which a shallow (less than 70m water depth) open marine environment was recorded by the ostracod

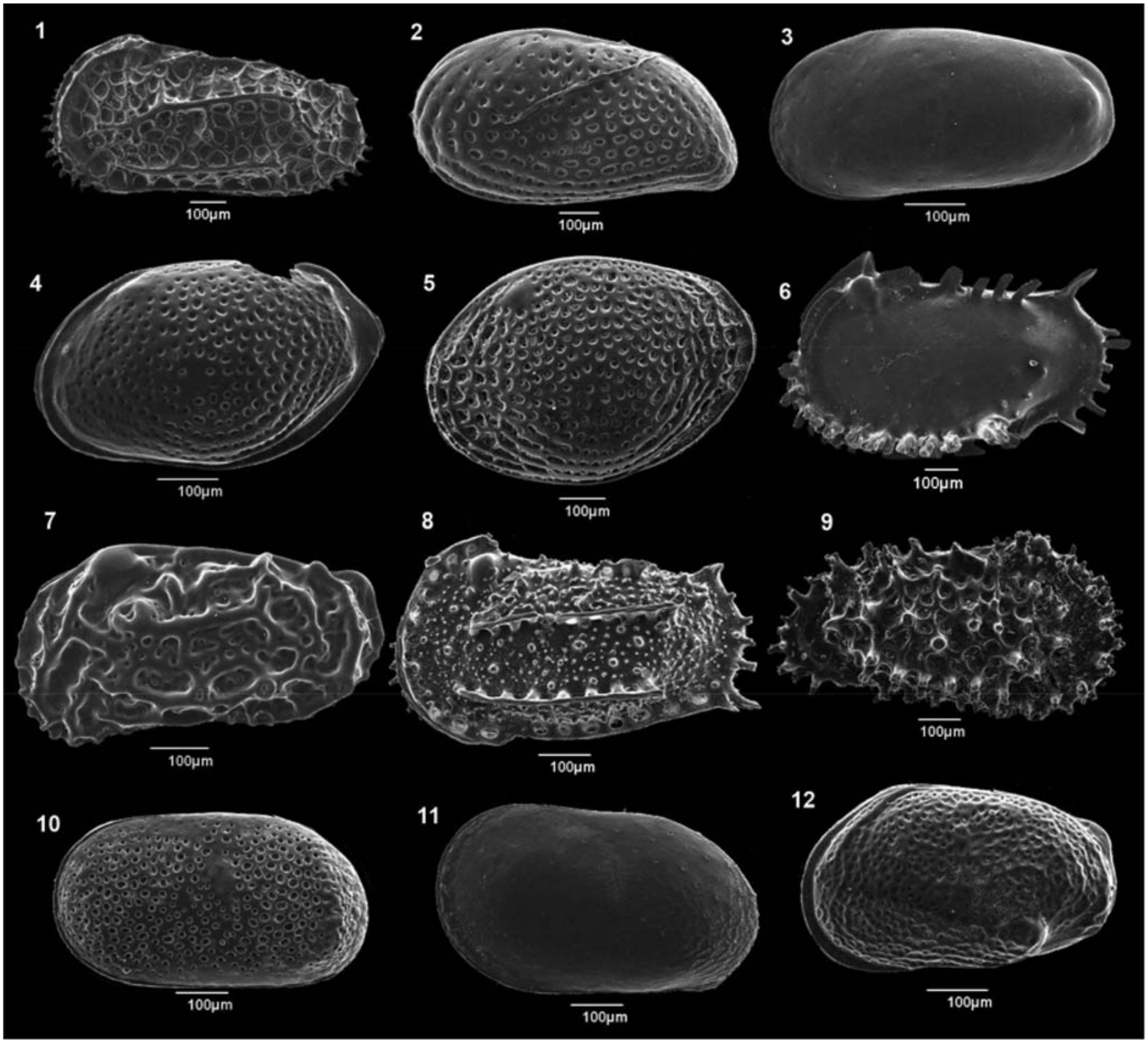


PLATE 1

Lateral external views (RV: right valve, LV: left valve) of some of the most abundant ostracod species in the studied samples.

1 *Costa edwardsii* (Roemer 1838), LV, sample DEH 1 128-130cm.

2 *Cytheridea neapolitana* Kollmann 1960, LV, sample DEH 1 128-130cm.

3 *Leptocythere ramosa* (Rome 1942), LV, sample DEH 1 128-130cm.

4 *Palmoconcha agilis* (Ruggieri 1967), LV, sample DEH 1 128-130cm.

5 *Loxoconcha ovulata* (Costa 1863), LV, sample DEH 5 30-31cm.

6 *Pterygocythereis jonesii* (Baird 1850), LV, sample DEH 1 130-132cm.

7 *Callistocythere crispata* (Brady 1868), LV, sample DEH 5 11-12cm.

8 *Carinocythereis carinata* (Roemer 1838), LV, sample DEH 5 28-29cm.

9 *Acanthocythereis hystrix* (Reuss 1850), RV, sample DEH 5 11-12cm.

10 *Cytherella scutulum* Ruggieri 1976, LV, sample DEH 5 11-12cm.

11 *C. vulgata* Ruggieri 1962, LV; sample DEH 5 11-12cm.

12 *Cytheromorpha fuscata* (Brady 1869), LV, DEH 5 sample 135-136cm.

assemblages. The following environmental changes were recognized along DEH 1:

Interval 234-189cm (from 8150 to 7920 cal yr BP) - In the lower part of this interval (234-200cm) ostracod assemblages are composed mainly of *Costa edwardsii*, *P. agilis* and *Xestoleberis communis*. *C. edwardsii* occurs in the Mediterranean from 20m to 200m water depth but it is characteristic of the outer infralittoral-shallow circalittoral zone (Yassini 1979; Mostafawi and Matzke-Karasz 2006; Ruiz et al. 2008). In this interval, the presence of *C. edwardsii* in combination with the significant presence of *P. agilis* and the marine to mesohaline *X. communis*, point to an open marine infralittoral environment.

Upwards, *C. edwardsii* presents its higher frequencies, accompanied mainly by the shallow littoral *P. agilis*. According to Yassini (1979) and Mostafawi and Matzke-Karasz (2006), *C. edwardsii* prevails at depths ranging between 50 and 100m. Consequently, the composition of the whole assemblage in this interval indicates an open marine environment deeper than 50m. Finally, the significant presence of allochthonous *C. torosa* in this portion of the core suggests that an inner part of the Southern Evoikos basin remained shallow and relatively restricted for this time span.

Interval 189-117cm – 7920 to 4860 cal yr BP - The interval (189cm-160cm) is still characterized by the assemblage dominated by *Costa edwardsii*, but there is a change in the accompanying fauna: shallow marine to mesohaline species are displaced by clearly marine infralittoral species such as *Cytheridea neapolitana*. This assemblage indicates the establishment of an open marine depositional environment.

In the upper part (160-117cm) of the core, ostracod assemblage consists mainly of *C. edwardsii*, *C. neapolitana*, *C. crispata*, *P. jonesii* and *L. ramosa*. This assemblage presents a decrease in infralittoral species and an increase in the circalittoral ones as *Pterygocythereis jonesii*. *P. jonesii* prefers depths above 80m in the inner circalittoral zone (Mostafawi and Matzke-Karasz 2006; Ruiz et al. 2008). These assemblages are highly diversified and represent an open marine environment corresponding to the shallow circalittoral zone.

The Southern Evoikos shelf

The environmental interpretation of the results from the ostracod analysis present strong evidence that a restricted, quite shallow, less than 30m deep, oligohaline lagoon was formed sometime before 13540 cal yr BP at the northern basin of Southern Evoikos Gulf. This closed lagoon existed until 11065 cal yr BP. For the time span 13540 to 11065 cal yr BP the closed lagoonal shallow environment presented salinity fluctuations, as it is indicated by the alternation of oligohaline and mesohaline faunas and gradually mesohaline conditions were established. The salinity pattern indicates that the lagoon was influenced by the freshwater input from the hydrographic network of the area and short junctions with a nearby marine environment.

Subsequently, after 11065 cal yr BP, an open, less than 70m water deep, marine environment similar to the present one was established. Specifically, since 11065 cal yr BP an open infralittoral environment was formed up to about 8000 cal yr BP and afterwards a shallow circalittoral one.

The environmental scheme for South Evoikos Gulf which the current study suggests for the Holocene is in accordance with the coastline configuration proposed by Perissoratis and van Andel (1991) and Perissoratis and Conispoliatis (2003). Namely, at 11800 cal yr BP where the sea-level was at -60m, South Evoikos constituted a restricted environment, while at 8000 cal yr BP when the sea-level was at -15m, the coastal configuration was almost like the present one in the steep coastal areas.

Generally, sea-level during the latest Pleistocene (Last Glacial Maximum, 21000-18000 yr BP) was more than 120m lower than it is today, subsequently a rapid rise of the sea-level occurred from about 15000 yr BP to about 6-7 kyr BP (Fairbanks 1989; Bard, Hamelin and Fairbanks 1990 ; Alessio et al. 1994; Lambeck 1995).

The palaeoenvironmental reconstruction of South Evoikos Gulf presented herein is consistent with the sea-level curve proposed for several Mediterranean localities as the Tyrrhenian coast (Alessio et al. 1994; Antonioli et al. 1998; Lambeck et al. 2004), the French Mediterranean coast (Lambeck and Bard 2000) and the Mediterranean coast of Israel (Sivan et al. 2001). According to these studies the Holocene is characterized by a rapid sea-level rise up to 6-7000 yr BP. The sea-level rise rate seems to slightly decrease between about 8500 to 6500 yr BP, followed by a slow rise up to the present. At about 8000 yr BP sea-level is estimated about 15m lower than it is today and, while at 6000 yr BP sea-level at -2m to -3m and progressively the shorelines took their present position.

CONCLUSIONS

South Evoikos Gulf constitutes a semi-enclosed basin with low tectonic activity. The distribution of ostracod assemblages in the investigated cores indicates that the northern basin of the Southern Evoikos gulf was isolated, forming a shallow oligohaline lagoon up to 11860-11065 cal yr BP, namely at the beginning of the Holocene. At this point, an environmental change took place and subsequently, during Holocene, an unrestricted communication with the sea was established and a marine coastal environment was formed, with a gradual transition (the beginning of which is estimated at about 8000 cal yr BP in core DEH 1) from an infralittoral to a circalittoral sea.

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APPENDIX 1
Absolute abundances of the ostracod species in the studied samples of DEH 1.

depth (cm)	232-234	230-232	226-228	224-226	222-224	220-222	218-220	216-218	214-216	212-214	210-212	208-210	206-208	204-206	202-204	199-202	197-199	195-197	193-195	191-193	189-191	187-189	185-187	183-185	181-183	179-181	177-179	175-177	173-175	171-173	168-171	166-168	164-166	162-164	160-162	158-160	156-158	154-156	152-154	150-152	148-150	146-148	144-146	142-144	140-142	138-140	136-138	134-136	132-134	130-132	128-130	126-128	124-126	122-124	120-122	117-120
Aurila sp.	0	0	0	3	0	0	0	0	2	0	1	0	2	0	0	0	0	0	0	0	0	0	0	1	0	3	1	0	0	1	0	0	1	0	1	4	1	0	0	0	0	0	2	0	0	0	4	0	1	2	0	0	3	0	1	1
Bosquetina dentata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	1	1	2	5	5	3	3	3	4
Buntonia sulatissima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Callistocythere crispata	1	0	0	4	1	2	2	0	0	0	2	1	0	0	0	0	0	3	7	2	0	2	3	3	1	1	3	0	2	5	2	2	11	1	9	15	7	59	18	10	94	38	105	24	23	68	166	46	183	34	195	73	172	46	78	157
Candona sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Carinocythereis carinata	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	6	3	0	2	1	1	0	0	1	1	0	0	0	0	4	1	1	5	2	5	1	1	4	6	6	7	7	8	12	8	12	8	14	2	12	1	9	8
Caudites calceolatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
Costa edwardsii	19	13	11	29	15	50	13	13	16	5	10	14	14	3	4	5	18	66	82	99	21	53	254	91	142	154	119	65	47	190	107	30	319	43	192	253	65	207	87	30	345	139	397	73	97	93	233	84	220	65	305	71	165	33	75	118
Cyprideis torosa	8	7	5	21	8	17	3	14	12	7	4	5	3	1	2	1	4	8	28	24	3	6	18	6	13	12	7	5	3	10	6	3	26	0	5	14	1	6	4	1	11	0	10	2	2	8	11	5	12	3	7	4	7	5	6	10
Cyprinotus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Cytherella scutulum	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	5	6	0	9	5	11	4	6	3	6	19
Cytherella vulgata	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	1	0	3	2	5	2	4	2	5	1	2	0
Cytheretta sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Cytheridea neapolitana	0	2	0	0	1	1	2	1	1	0	0	2	2	1	0	0	0	2	3	4	1	2	27	13	1	0	24	9	1	5	7	13	57	17	72	78	36	75	38	19	111	40	83	35	35	27	66	45	126	47	169	41	116	47	73	105
Cytheropteron spp.	2	0	1	6	1	3	1	6	9	2	7	4	6	0	0	1	0	3	16	9	1	4	39	14	18	12	2	6	0	25	6	1	51	0	19	21	1	21	7	0	26	6	25	4	5	14	24	15	43	10	55	7	42	6	12	23
Echinocythereis sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucytherura complexa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucytherura mistrettai	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Hemicytherura gracilicosta	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	1	1	0	0	0	1	0	0	0	0	0	1
Hiltermannicythere turbida	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	31	9	26	1	7	2	0	5	7	2	0	1	6	3	14	0
Krithe sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Leptocythere ramosa	0	0	0	4	0	1	0	1	1	0	1	1	2	0	0	0	0	3	2	1	0	1	20	5	1	2	10	5	0	3	2	4	52	2	47	60	19	53	25	4	102	32	110	22	12	34	70	13	41	25	93	7	55	5	23	18
Leptocythere rara	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	1	0	0	0	0	0	0	0	7	0	4	8	1	5	1	0	12	5	18	1	0	4	5	0	3	0	1	0	1	0	2	2
Loxocauda decipiens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Loxoconcha affinis	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	3	2	0	0	2	16	14	0	0	2	0	0	0	0	0	1	0	0	0	7	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Loxoconcha alata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	4	0	2	3	1	0	0	0	0	0	0	0	0	4	0	0	4	0	3	2	0	8	1	0	1	0	2	4	0	3	2	3	1	4	0	2	3
Monoceratina mediterranea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Palmoconcha agilis	20	8	9	39	7	58	9	20	19	6	27	25	21	3	1	2	8	34	45	26	1	20	55	0	48	37	15	10	6	41	13	8	90	7	32	32	4	13	6	0	29	11	32	5	6	9	36	11	39	20	43	11	39	1	9	26
Paracytheridea depressa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	1	0	2	0	0	0	0	0	1	0	1	0	1	0	0	1
Paradoxostoma sp.	0	0	0	0	0	1	0	0	1	0	4	0	0	0	0	0	0	0	1	1	0	0	0	3	6	0	0	0	0	2	0	0	5	0	0	11	0	10	3	0	13	2	0	0	1	4	8	2	17	8	23	7	10	1	3	31
Propontocypris sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pterygocythereis jonesii	0	0	1	0	1	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	14	5	4	5	5	5	1	8	5	0	13	1	11	13	2	11	9	4	20	12	26	10	10	5	23	17	44	24	67	8	27	5	20	30
Sagmatocythere versicolor	2	0	0	5	0	3	0	3	2	1	5	2	4	0	0	0	0	0	0	0	0	0	31	4	8	4	3	1	0	10	2	0	21	0	7	5	4	8	3	0	13	3	19	2	2	12	24	8	19	6	43	8	32	2	7	22
Semicytherura acuta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	2	0	0	2
Semicytherura alifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	1	0	0	2	1	0	0	4	0	2	0	0	0
Semicytherura incogruens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Semicytherura inversa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	3	0	0	0	0	0	1	0
Semicytherura paradoxa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	4	1	2	0	0	2
Semicytherura ruggierii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3	0	1	1	0	0	0	0	1	0	0	0	0	0	1	2	0	0	1	0	0	0	0	2	4	2	3	1	0	0	4	0	0	3
Semicytherura sp.	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	2	2	0	1	1	0	0	1	0	0	0	3	0	2	3	0	0	0	0	3	0	5	0	0	0	4	2	3	0	4	2	4	0	1	3
Triebelina sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
Xestoleberis communis	2	0	0	9	0	3	0	0	4	0	2	3	2	0	0	1	1	2	6	3	0	1	8	0	6	5	3	1	1	7	4	0	10	0	2	7	1	4	1	0	8	0	9	0	0	3	9	2	6	3	10	5	7	3	5	16
Xestoleberis fuscomaculata	2	0	1	0	0	0	2	0	2	0	1	2	1	0	0	0	1	1	12	5	0	3	15	0	14	9	1	3	0	13	1	0	14	0	6	8	7	8	2	0	9	0	10	2	2	11	21	3	18	4	20	6	20	2	6	19
Xestoleberis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	1	0	1	0	0	0	0	2	0	0	0
Urocythereis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	2	0	1	1
Total	57	30	28	122	35	142	33	61	71	23	65	61	62	8	7	10	33	132	216	182	27	100	511	162	269	249	197	112	62	324	156	61	694	73	412	543	155	499	207	69	846	306	892	190	213	320	742	274	820	277	1086	266	751	169	359	628

APPENDIX 2a
Absolute abundances of the ostracod species in the studied samples of DEH 5.

depth(cm)	81-82	83-84	85-86	86-87	88-89	90-91	91-92	93-94	95-96	96-97	98-99	100-101	101-102	102-103	103-104	105-106	106-107	108-109	110-111	111-112	113-114	115-116	116-117	118-119	120-121	121-122	123-124	125-126	126-127	128-129	130-131	132-133	133-134	134-135	135-136	136-137	138-139	140-141	141-142	143-144	145-146	146-147	148-149	149-150	150-151
Acanthocythereis hystrix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aurila convexa	0	0	0	16	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bosquetina dentata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buntonia sublatissima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Callistocythere crispata	0	0	0	16	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Candona neglecta	16	0	4	0	32	0	0	2	0	16	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Carinocythereis carinata	8	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Costa edwardsii	0	1	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyprideis torosa	1184	230	948	4000	4960	660	66	458	952	3456	2592	2432	2104	5712	2008	4128	5792	488	1808	342	2768	10720	4416	10528	4192	4368	2188	190	572	634	9832	10880	888	665	349	56	576	51	123	114	87	43	268	214	986
Cyprinotus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
Cytherella scutulum	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Cytherella vulgata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cytheretta sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cytheridea neapolitana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cytheromorpha fuscata	72	4	40	96	128	16	1	56	148	688	192	688	448	608	64	1088	1728	34	240	14	208	544	336	3200	1520	1408	676	91	48	18	256	672	64	172	170	9	62	1	3	10	12	5	24	8	52
Cytheropteron spp.	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucythere sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucytherura complexa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucytherura mistrettai	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hemicytherura gracilicosta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hiltermannicythere turbida	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ilyocypris sp.	0	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptocythere lagunae	0	4	0	0	0	0	0	0	4	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptocythere ramosa	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptocythere rara	8	1	12	0	0	8	0	6	4	48	0	24	32	144	16	176	96	3	24	2	32	96	64	512	192	168	60	12	8	0	96	256	10	11	11	0	6	0	2	9	10	3	20	10	39
Limnocythere inopinata	8	0	0	16	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	40	68	4	0	16	0	6	130	92	2	3	6	1	5	30	4	7	3	7
Loxocauda decipiens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loxoconcha elliptica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loxoconcha ovulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loxoconcha sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monoceratina mediterranea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Palmoconcha agilis	0	2	4	16	0	0	0	0	0	0	0	8	0	0	8	0	0	1	0	2	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3
Paracytheridea depressa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paradoxostoma spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Propontocypris sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pterygocythereis jonesii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagmatocythere versicolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Semicytherura acuta	0	0	0	0	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Semicytherura alifera	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Semicytherura incogruens	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Semicytherura inversa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Semicytherura paradoxa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Semicytherura ruggierii	0	2	4	0	32	4	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Semicytherura sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tetracytherura angulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Triebelina sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Urocythereis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xestoleberis communis	0	0	0	0	32	0	0	0	0	16	0	0	0	16	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Xestoleberis decipiens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xestoleberis fuscomaculata	16	4	16	0	0	0	0	2	0	16	0	0	40	320	16	0	0	1	0	2	0	64	48	32	0	24	4	4	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0
Xestoleberis parva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xestoleberis sp.	8	1	0	0	0	0	0	0	0	16	0	0	8	0	0	16	0	0	0	0	0	0	0	128	0	0	16	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
total	1336	249	1032	4176	5216	700	68	528	1108	4272	2816	3168	2640	6800	2112	5408	7616	531	2080	362	3008	11456	4864	14400	5904	6000	2996	365	634	652	10208	11808	968	982	622	67	658	58	129	138	139	55	320	235	1087

APPENDIX 2b
Absolute abundances of the ostracod species in the studied samples of DEH 5.

depth(cm)	11_12	12_13	15-16	16-17	18-19	20-21	21-22	23-24	25-26	26-27	28-29	30-31	31-32	32-33	33-34	35-36	36-37	38-39	40-41	41-42	43-44	45-46	46-47	48-49	50-51	51-52	53-54	55-56	56-57	58-59	60-61	61-62	63-64	65-66	66-67	68-69	70-71	71-72	73-74	75-76	76-77	78-79	80-81
Acanthocythereis hystrix	36	48	20	40	20	4	16	24	4	2	7	0	4	0	4	0	0	4	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Aurila convexa	0	12	0	8	8	0	0	4	4	4	1	6	8	0	4	0	0	4	4	0	0	8	0	0	0	0	0	0	0	4	4	0	8	0	0	0	0	0	0	0	8	8	0
Bosquetina dentata	10	4	12	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buntonia sublatissima	0	0	8	8	4	0	0	8	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Callistocythere crispata	96	160	68	76	36	16	12	64	52	16	11	6	16	4	18	6	0	40	60	28	16	0	8	8	64	4	4	0	0	12	4	0	0	0	4	0	0	16	8	8	8	8	0
Candona neglecta	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	12	24	20	32	48	8	32		16	24	12	24	16	12	80	88	40	20	64	20	64	0	16	0	8	16
Carinocythereis carinata	6	0	0	8	0	4	0	0	12	14	36	108	68	126	56	60	84	160	276	104	24	16	16	104	32	4	4	8	8	24	32	24	0	0	4	4	4	32	24	12	0	24	8
Costa edwardsii	8	16	0	4	0	0	0	0	8	9	4	10	0	0	2	2	4	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyprideis torosa	20	20	0	28	8	16	8	44	24	59	108	118	152	92	134	146	128	232	992	416	580	1312	892	1016	816	476	760	500	360	504	748	1160	1632	1304	664	464	764	2192	1312	1076	968	2368	1776
Cyprinotus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cytherella scutulum	28	36	16	4	4	8	12	8	20	8	4	0	0	2	0	6	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0
Cytherella vulgata	48	52	20	36	28	8	4	40	12	4	6	4	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cytheretta sp.	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cytheridea neapolitana	12	24	16	16	12	0	0	4	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Cytheromorpha fuscata	0	0	0	0	0	0	0	0	4	5	2	0	0	2	0	4	4	8	12	12	8	16	0	32	16	12	8	4	8	12	24	24	32	16	20	32	48	192	136	40	80	168	88
Cytheropteron spp.	10	12	4	0	12	8	4	8	0	2	1	0	0	0	2	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucythere sp.	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucytherura complexa	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eucytherura mistrettai	24	16	0	4	20	4	0	8	8	2	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0
Hemicytherura gracilicosta	2	4	4	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hiltermannicythere turbida	2	4	4	4	0	0	0	0	4	1	4	12	8	8	10	2	0	0	0	4	0	0	0	0	0	0	0	0	4	0	8	0	0	0	0	0	0	0	0	0	0	0	0
Ilyocypris sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
Leptocythere lagunae	0	0	0	0	0	4	0	8	8	7	18	62	44	38	58	30	36	68	260	76	36	16	36	112	64	8	12	0	0	16	36	48	0	0	8	0	20	0	0	20	0	0	0
Leptocythere ramosa	2	12	0	8	0	0	0	4	12	13	18	28	36	22	36	18	20	40	88	44	12	8	16	48	16	4	8	12	12	8	8	8	0	0	4	0	4	0	8	12	0	0	0
Leptocythere rara	0	0	0	0	0	0	0	0	4	0	1	20	16	6	12	12	4	44	104	84	48	48	16	24	56	24	8	12	16	12	18	24	0	0	8	0	0	0	0	16	16	16	32
Limnocythere inopinata	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	16	8	0	8	44	12	96	0	64	32	16	0
Loxocauda decipiens	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loxoconcha elliptica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loxoconcha ovulata	10	0	0	8	0	0	0	0	24	0	0	96	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loxoconcha sp.	0	0	0	0	4	0	0	28	4	2	0	0	0	4	0	0	0	0	0	0	0	8	0	16	24	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monoceratina mediterranea	0	4	0	4	0	0	0	0	4	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Palmoconcha agilis	0	28	12	4	8	12	4	0	20	35	47	0	92	86	106	60	48	204	316	236	120	240	48	200	128	44	32	8	12	12	24	24	24	0	4	4	12	16	0	16	0	0	8
Paracytheridea depressa	6	12	8	0	4	8	0	4	4	0	0	2	0	0	0	0	0	0	0	0	4	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0
Paradoxostoma spp.	2	8	0	0	0	4	0	4	12	2	1	4	12	0	8	2	0	12	8	4	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
Propontocypris sp.	0	12	0	0	0	0	0	0	4	0	1	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0
Pterygocythereis jonesii	4	0	8	12	4	0	0	12	4	1	3	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sagmatocythere versicolor	6	16	8	0	0	4	0	8	0	4	0	4	0	2	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Semicytherura acuta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Semicytherura alifera	2	8	0	4	0	4	0	8	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	4	0	0	4	0	8	0	8	0	0	0	0	0	0	8	0	0
Semicytherura incogruens	6	4	4	0	0	0	0	0	4	1	4	8	4	4	4	12	0	0	16	8	0	0	0	0	32	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	8	0	0
Semicytherura inversa	4	0	0	0	0	0	0	0	0	1	1	8	0	0	0	0	0	12	8	4	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Semicytherura paradoxa	0	0	0	4	0	8	0	8	4	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Semicytherura ruggierii	8	0	0	0	0	0	4	0	0	11	8	14	0	6	4	0	24	4	0	4	8	0	4	0	0	0	0	0	0	0	0	16	0	0	8	4	0	16	0	0	0	8	0
Semicytherura sp.	2	8	4	0	8	0	0	12	4	2	4	6	0	0	2	2	0	12	16	0	4	0	0	8	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Tetracytherura angulosa	0	4	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
Triebelina sp.	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Urocythereis sp.	0	0	8	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Xestoleberis communis	20	24	8	12	16	8	8	16	12	15	10	24	28	14	20	20	20	48	32	36	32	8	8	64	40	20	0	0	0	8	8	40	0	0	20	8	4	16	8	8	0	8	8
Xestoleberis decipiens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xestoleberis fuscomaculata	8	20	8	16	0	4	8	16	8	12	27	114	88	82	96	74	28	152	192	80	52	56	0	152	40	4	0	20	20	28	4	0	24	8	0	24	20	80	48	12	8	48	0
Xestoleberis parva	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Xestoleberis sp.	0	0	0	0	0	0	0	0	0	1	0	8	0	6	0	0	0	12	32	8	16	24	8	24	16	8	12	0	8	0	4	0	16	0	16	0	8	0	16	4	40	64	72
total	394	584	248	308	196	128	80	356	288	242	332	670	578	504	580	468	404	1076	2444	1172	1012	1824	1060	1856	1344	628	876	576	480	664	946	1480	1840	1376	792	656	928	2720	1560	1308	1184	2744	2008

APPENDIX 3
The community structure indices calculated for the studied samples in both cores.

DEH 1					DEH 5									
depth(cm)	Number of taxa	Dominance (D)	Shannon Wiener	Fisher-a	depth (cm)	Number of taxa	Dominance (D)	Shannon Wiener	Fisher-a	depth(cm)	Number of taxa	Dominance (D)	Shannon Wiener	Fisher-a
117-120cm	27	0,1386	2,386	5,739	11_12	29	0,1022	2,75	7,218	102-103	5	0,7163	0,602	0,5284
120-122cm	23	0,145	2,318	5,479	12_13	28	0,1072	2,776	6,131	103-104	5	0,905	0,2491	0,614
122-124cm	19	0,1952	2,033	5,494	15-16	20	0,1108	2,627	5,13	105-106	4	0,6242	0,6575	0,423
124-126cm	28	0,1405	2,362	5,735	16-17	21	0,1128	2,565	5,101	106-107	3	0,63	0,5999	0,2953
126-128cm	20	0,1778	2,16	5,012	18-19	16	0,09788	2,521	4,121	108-109	8	0,8488	0,3511	1,336
128-130cm	26	0,1534	2,244	4,79	20-21	18	0,07227	2,756	5,707	110-111	4	0,769	0,4439	0,4773
130-132cm	24	0,1243	2,436	6,308	21-22	10	0,125	2,181	3,017	111-112	5	0,8941	0,2656	0,8208
132-134cm	25	0,158	2,249	4,872	23-24	25	0,08269	2,822	6,129	113-114	3	0,8517	0,3096	0,3289
134-136cm	21	0,1627	2,227	5,296	25-26	28	0,0706	2,985	7,666	115-116	5	0,878	0,2923	0,4978
136-138cm	25	0,1727	2,224	4,992	26-27	31	0,1047	2,739	9,447	116-117	4	0,8293	0,3749	0,4284
138-140cm	23	0,1558	2,315	5,681	28-29	27	0,1545	2,387	6,945	118-119	5	0,5853	0,7374	0,4855
140-142cm	17	0,2553	1,871	4,345	30-31	25	0,1208	2,436	5,121	120-121	3	0,5715	0,7039	0,3038
142-144cm	15	0,2166	1,898	3,82	31-32	15	0,146	2,184	2,814	121-122	5	0,5859	0,7214	0,5363
144-146cm	21	0,2409	1,963	3,854	32-33	17	0,1607	2,09	3,395	123-124	9	0,5849	0,7647	1,143
146-148cm	15	0,2547	1,826	3,305	33-34	20	0,1407	2,244	4,016	125-126	5	0,369	1,161	0,8195
148-150cm	22	0,2156	2,043	4,13	35-36	19	0,1647	2,168	3,978	126-127	5	0,8199	0,3935	0,7403
150-152cm	7	0,293	1,45	1,947	36-37	12	0,1793	1,992	2,324	128-129	2	0,9463	0,1263	0,2549
152-154cm	15	0,2374	1,863	3,714	38-39	20	0,1357	2,286	3,487	130-131	5	0,9284	0,1882	0,5042
154-156cm	19	0,2245	1,985	3,912	40-41	18	0,216	1,969	2,634	132-133	3	0,8527	0,3216	0,2819
156-158cm	17	0,251	1,826	4,869	41-42	18	0,1919	2,056	3,018	133-134	4	0,8461	0,3375	0,533
158-160cm	19	0,2582	1,923	3,83	43-44	19	0,3522	1,703	3,32	134-135	8	0,5069	0,9152	1,191
160-162cm	17	0,2709	1,768	3,575	45-46	15	0,5376	1,127	2,237	135-136	4	0,4117	1,033	0,572
162-164cm	8	0,4119	1,21	2,291	46-47	11	0,7123	0,7587	1,71	136-137	3	0,7175	0,5244	0,6447
164-166cm	23	0,2496	1,953	4,574	48-49	16	0,3277	1,704	2,406	138-139	12	0,7753	0,5079	2,084
166-168cm	7	0,3126	1,451	2,04	50-51	13	0,3876	1,567	1,996	140-141	3	0,7842	0,4178	0,671
168-171cm	12	0,4846	1,292	3,03	51-52	13	0,5834	1,072	2,319	141-142	4	0,91	0,2352	0,7826
171-173cm	17	0,3711	1,583	3,818	53-54	11	0,7555	0,6627	1,773	143-144	4	0,6932	0,6463	0,7701
173-175cm	8	0,5884	0,9596	2,445	55-56	8	0,7565	0,6348	1,315	145-146	4	0,451	1,025	0,7688
175-177cm	12	0,3611	1,573	3,406	56-57	12	0,5701	1,12	2,232	146-147	4	0,6278	0,7597	0,9917
177-179cm	15	0,391	1,512	3,775	58-59	14	0,5821	1,131	2,508	148-149	5	0,7114	0,6177	0,8412
179-181cm	15	0,4119	1,435	3,508	60-61	17	0,6299	1,025	2,943	149-150	4	0,8324	0,3903	0,6848
181-183cm	18	0,3223	1,666	4,346	61-62	13	0,6204	1,007	1,962	150-151	5	0,8264	0,402	0,6774
183-185cm	14	0,3416	1,651	3,676	63-64	9	0,7898	0,5477	1,231					
185-187cm	17	0,2767	1,876	3,384	65-66	5	0,8991	0,2654	0,6533					
187-189cm	13	0,3296	1,623	3,986	66-67	14	0,7057	0,8245	2,416					
189-191cm	5	0,6214	0,8058	1,805	68-69	11	0,5184	1,131	1,877					
191-193cm	13	0,3386	1,562	3,204	70-71	14	0,6824	0,8557	2,339					
193-195cm	17	0,216	1,937	4,325	71-72	10	0,6574	0,8441	1,309					
195-197cm	15	0,3232	1,612	4,356	73-74	8	0,7163	0,6577	1,103					
197-199cm	6	0,3737	1,248	2,146	75-76	14	0,6811	0,8673	2,189					
199-202cm	5	0,32	1,359	3,98	76-77	11	0,6753	0,8195	1,676					
202-204cm	3	0,4286	0,9557	1,989	78-79	12	0,7495	0,6432	1,613					
204-206cm	4	0,3125	1,255	3,184	80-81	8	0,7858	0,5355	1,06					
206-208cm	15	0,1873	2,095	6,29	81-82	10	0,7888	0,5543	1,467					
208-210cm	11	0,2389	1,818	3,918	83-84	9	0,8542	0,4164	1,829					
210-212cm	12	0,2241	1,904	4,325	85-86	8	0,8458	0,4065	1,181					
212-214cm	7	0,2212	1,666	3,427	86-87	7	0,9181	0,2346	0,8201					
214-216cm	13	0,1736	2,015	4,666	88-89	6	0,905	0,2638	0,6696					
216-218cm	10	0,219	1,746	3,4	90-91	6	0,8898	0,3031	0,9014					
218-220cm	8	0,2507	1,661	3,359	91-92	3	0,9425	0,1531	0,6421					
220-222cm	13	0,307	1,501	3,483	93-94	7	0,7639	0,4967	1,14					
222-224cm	8	0,28	1,53	3,242	95-96	4	0,7561	0,4399	0,5221					
224-226cm	11	0,2008	1,874	2,932	96-97	8	0,6806	0,6206	0,9512					
226-228cm	6	0,2934	1,397	2,343	98-99	4	0,8519	0,3182	0,4585					
230-232cm	4	0,3178	1,235	1,24	100-101	6	0,6366	0,6169	0,7145					
232-234cm	9	0,2595	1,621	3,006	101-102	6	0,6644	0,634	0,7326					