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Community structure and dynamics of the molluscan fauna in a Mediterranean lagoon (Gialova lagoon, SW Greece)

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ABSTRACT. The molluscan community of a shallow Mediterranean lagoon (Gialova lagoon, SW Greece, Ionian Sea) was studied on a seasonal basis during 1995-1996. A total of 23 species were recorded from the lagoon. Two of them namely: *Placida viridis* and *Polycerella emertoni* are reported for the first time from the Greek seas and the Eastern Mediterranean respectively. The dominant species were the gastropods *Bittium reticulatum, Cerithium vulgatum, Pirenella conica, Hydrobia acuta, Cyclope neritea* and the bivalves *Cerastoderma glaucum, Abra ovata*. Uni- and multivariate methods were employed to study the community structure and dynamics. On the basis of the multivariate pattern of the molluscan community a *coenocline* is observed which is strongly related with the degree of isolation. Two main zones with different faunal composition can be distinguished: one narrow zone close to the channel of communication with the sea and another in the innermost part of the lagoon. Following the *confinement scale* suggested for lagoonal ecosystems by Guelorget & Perthuisot (1992) the first zone can be assigned to the "zone III" and the second to "zones IV-V". The distribution pattern of the molluscan community is governed by a different set of environmental variables in each season, discussed in detail. Although no disturbance due to anthropogenic impact was revealed, this narrow lagoonal habitat was proved to suffer severe "dystrophic episodes", during late summer and the beginning of autumn, but successfully recovered, demonstrating a seasonal community pattern.

KEY WORDS: Molluscs, coastal lagoons, population structure and dynamics, environmental impact studies, Ionian Sea.

INTRODUCTION

The distribution and dynamics of macrobenthic populations living in coastal lagoons are strongly influenced by fluctuations in the physicochemical factors, induced by the mixing of freshwater and sea inflows (Amanieu & Lasserre, 1982). Anthropogenic pollutants (domestic, industrial, oil discharges, etc.) transported by rivers and sea waters, interacting with the unstable environmental conditions also contribute to perturbations of the ecosystem (Lardicci et al., 1997). In such highly variable environments, complementary long and short term studies, carried out in a range of different biotopes, are required to achieve a better understanding of the synergistic or specific actions of natural or man-made factors on the spatial and temporal benthic community patterns (Stora et al., 1995). Molluscs are either the dominant group or an important component of the macrobenthic fauna of European lagoons (Barnes, 1980; Guelorget & Perthuisot, 1992). Biological and ecological aspects of mollusc species distributed in lagoons have been studied in detail (e.g. Ivell, 1979; Barnes, 1980; Guelorget & Mayere, 1981). The role of certain abiotic factors (mainly salinity and sediment type) in the distribution pattern of the molluscan communities has also been investigated (e.g. Zaouali, 1975; Barash & Danin, 1982; Bourgoutzani & Zenetos, 1983). However, mechanisms structuring lagoonal animals and in particular molluscs have only recently received considerable attention (e.g. Nicolaidou et al., 1988; McArthur, 1998), but still we are no nearer to putting them in rank order of importance (Barnes, 1994). Furthermore, assessment of disturbance (natural or anthropogenic) in this type of ecosystem is

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generally unreported (Reizopoulou et al., 1996; Lardicci et al., 1997).

Gialova lagoon is one of the 10 major lagoons of Greece with an important fisheries value and of great naturalistic interest, as it has been characterised as one of the important bird areas in Europe (Koutsoubas et al., 2000 and references therein). Recently, this coastal ecosytem suffered an oil spill impact in October 1993 leading to the extensive mortality of fish when the oil tanker "Iliad" hit bottom in the entrance of the neighboring Navarino bay (Dounas et al., 1998 and references therein). The oil spill incident was the reason for a multi-disciplinary study investigating the structure and functioning of Gialova lagoon along with the long-term impact of the oil spill on the biota.

The present contribution aims: (a) to analyse in detail the molluscan distribution pattern in the lagoon, (b) to investigate the key environmental factors affecting the molluscan community structure and (c): to assess the level of disturbance in the ecosystem through the molluscan biota.

MATERIAL AND METHODS

Study area

Gialova lagoon is a poly-hyperaline basin in SW Greece and lies between Navarino bay and Voidokilia embayment adjacent to the Ionian Sea (Eastern Mediterranean) (Fig. 1). It covers an area of 2.5 km^2, with a maximum depth of one metre and is connected with the adjoining Navarino bay via a small channel (100m long, 10m wide and 1.2m deep). Fluvial input is by two small inlets to the eastern part of the lagoon. Generally the sediment is muddy-sand, being covered in most areas with green algae and the eel grass *Cymodocea nodosa*. In small parts of the lagoon mud is mixed with dead shells of the bivalve *Cerastoderma glaucum*.

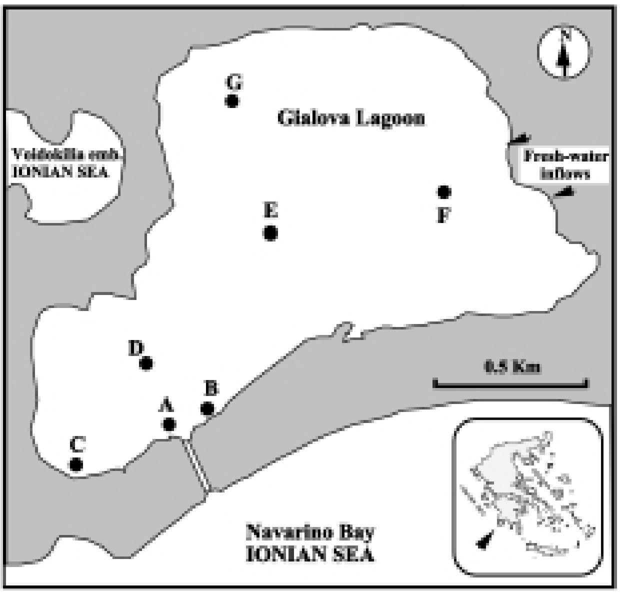

Fig. 1. – Map of Gialova lagoon indicating the seasonal sampling stations for molluscan community analysis.

Field sampling and processing

Seven stations were sampled to cover the entire body of the lagoon. Five replicate samples (total surface area of 0.25 m^2) were taken at each station in June 1995, September 1995, December 1995 and March 1996 with the use of a hand-operated van-Veen grab. The samples were sieved through a 0.5 mm mesh fixed in 5% neutralized formalin and preserved in ethyl alcohol (70%). Additional sediment and water samples were taken at each station for analysis of abiotic parameters: temperature, Redox potential, sediment particulate organic carbon (POC), chlorophyll-a, phaeopigments, mean diameter of sediment particles, silt-clay percentage, salinity (Practical Salinity Scale), dissolved oxygen, pH, ammonia, nitrates, nitrites, phosphates, and silicates. Finally sediment and bivalve samples for hydrocarbons were taken with the use of the van-Veen grab. In the laboratory, the living molluscs were sorted, identified to species level, counted and weighed after drying at 80°C for 48h. Estimations of the concentrations of the abiotic parameters listed above and hydrocarbons were obtained according to standard procedures (Koutsoubas et al., 2000 and references therein).

Data analysis

After identification to species level, molluscs were classified in relation to their environment, organismic assemblages distributed, life-mode, feeding type and zoogeographical categories (summarised in Table 1) based on information derived from Graham, 1955; Pérès & Picard (1964); Barnes (1980, 1994); Augier, 1982; Guelorget & Perthuisot (1983) and Koutsoubas (1992).

Molluscan community structure and dynamics were analysed by means of total number of species (S), average density (mean number of individuals/m^2), Shannon-Wiener diversity (H', log2 basis) and Margalef's species richness (d) indices. Biological data (mean of the five replicates from each sampling station) were also analysed by multivariate analyses after species' average densities per station had been transformed to the fourth root. Faunal similarities among the stations sampled were investigated using Cluster analysis (group average) and non-metric multidimensional scaling (MDS) (Kruskall & Wish, 1978) based on the Bray-Curtis similarity index of species composition between stations (Clarke & Green, 1988). Species maximally contributing to the dissimilarity among the station groups were investigated using the SIMPER percentages procedure (Clarke, 1993). Environmental variables best correlated with the multivariate pattern of the molluscan community were identified by means of harmonic Spearman coefficient (BIO-ENV analysis) as proposed by Clarke & Ainsworth (1993). Spearmann's rank correlation coefficient (ρ) was applied to identify any significant correlation between the number of mollusc species, density and biomass and the environmental vari-

TABLE 1

Autoecological and zoogeographical attributes of mollusc species found in Gialova lagoon. Abbreviations: MAR/EST=Marine/Estuarine species; SVMC= Assemblage of Superficial Muddy Sands in Sheltered Areas; HP=Assemblage of *Posidonia* meadows; AP=Assembalge of Photophilic Soft Algae; LEE=Euryhaline and eutythermal assemblages in brackish waters; SFHN=Assemblage of Fine Sands in very Shallow Waters; SGCF=Assemblage of Coarse Sand and Fine Gravels under Bottom Currents; EPI=vagile epifaunal; INF=vagile infaunal; SCRAP=scraper herbivore; BROW=browser herbivore; CARN=carnivore; SUSP=suspension feeder; OCCDEP=occasionally deposit feeder; E=Mediterranean endemic; AM=Atlanto-Mediterranean; B=Boreal; C=Cosmopolitan.

Mollusc Species	Stations	Environment	Organismic Assemblage	Life mode	Feeding type	ZC
GASTROPODA						
Trochidae						
Gibbula adansonii Payraudeau, 1826	A, C, D	MAR/EST	SVMC, HP	EPI	SCRAP	E
Gibbula divaricata (Linnaeus, 1758)	C	MAR/EST	AP, HP	EPI	SCRAP	AM
Jujubinus montagui (Wood W., 1828)	C	MAR/EST	AP, HP	EPI	SCRAP	AM
Cerithiidae						
Cerithium rupestre Risso, 1826	A, B, C	MAR/EST	AP, HP	EPI	BROW	AM
Cerithium vulgatum (Bruguiere, 1792)	A, B, C, D	MAR/EST	AP, HP	EPI	BROW	AM
Bittium reticulatum (Da Costa, 1778)	A, B, C, D	MAR/EST	AP, HP	EPI	BROW	B
Potamididae						
Pirenella conica (Blainville, 1826)	A, B, C, D, E, F, G	MAR/EST	LEE	EPI	SCRAP	E
Rissoidae						
Alvania beani (Hanley in Thorpe, 1844)	C	MAR/EST	AP	EPI	BROW	B
Rissoa aartseni Verduin, 1985	A, B, C	MAR/EST	SVMC, SFHN, HP		BROW	E
Rissoa violacea Desmarest, 1814	D	MAR/EST	HP		BROW	E
Rissoa variabilis (Von Muehlfeldt, 1824)	A, D	MAR/EST	HP		BROW	E
Pusillina radiata (Philippi, 1836)	A, B	MAR/EST	AP	EPI	BROW	E
Hydrobiidae						
Hydrobia acuta (Draparnaud, 1805)	A, B, C, D, E, F, G	MAR/EST	LEE	EPI	BROW	AM
Nassariidae						
Cyclope neritea (Linnaeus, 1758)	A, B, C, D	MAR/EST	SVMC, LEE	INF	CARN	AM
Nassarius incrassatus (Stroem, 1768)	A	MAR/EST	AP, SVMC	INF	CARN	B
Aplysiidae						
Aplysia depilans Gmelin, 1791	A, B, D	MAR/EST	AP, HP	EPI	BROW	AM
Stiligeridae						
Placida viridis (Trinchese, 1871)	D	MAR/EST	HP	EPI	BROW	E
Polyceridae						
Polycerella emertoni Verrill, 1881	C	MAR/EST	AP	EPI	CARN	C
BIVALVIA						
Lucinidae						
Loripes lacteus (Linnaeus, 1758)	A	MAR/EST	SVMC	INF	SUSP	AM
Cardiidae						
Cerastoderma glaucum (Poiret, 1789)	A, B, C, D, E, F, G	MAR/EST	LEE	INF	SUSP	AM
Semelidae						
Abra ovata (Philippi, 1836)	A, B, C, D, E, F, G	MAR/EST	LEE	INF	SUSP/ OCCDEP	E
Veneridae						
Clausinella brogniarti (Payraudeau, 1826)	A	MAR/EST	SGCF	INF	SUSP	E
Tapes decussatus (Linnaeus, 1758)	A, B	MAR/EST	SVMC	INF	SUSP	AM

ables. The PRIMER package, developed in Plymouth Marine Laboratory was used.

RESULTS

Abiotic data

The environmental data showed large variations, however, some distinct temporal and spatial trends were seen. The variables showing the clearest temporal trends were: temperature (ranging from 14°C in winter to 24°C in summer), salinity (from 13 psu in spring to 60 psu in autumn), dissolved oxygen (lowest in the autumn-3.5 mgl^{-1} and highest in the spring-9.1 mgl^{-1}), redox potential in the surface sediment (0 cm) [from oxic (398 mV) in winter to anoxic (-150 mV) in autumn]. A range of values for POC (1-8.2 mg/lt and 1.5-50.3 mg/g) and chloroplastic pigments (Chl-a 0.2-18.5 μg/lt and 1-62.4 μg/g; phaeopigments 0.2-17.6 μg/lt and 1-77 μg/g) were recorded from the water column and the sediment correspondingly. Nitrates (0.3-7.49 μM), nitrites (0.04-

0.64 μM) and ammonia (0.18-9.45 μM) concentrations also exhibited significant temporal fluctuations, with the maximum values reached in the spring. Spatial trends could be seen for sediment particulate organic carbon, chlorophyll-a and phaeopigments, which had a tendency to be much higher in the innermost stations C, D, E, F and G (20.95 to 38.03 mg/g; 5.86 to 64.07 μg/g; 18.68 to 59.84 μg/g for POC, Chl-a and phaeopigments correspondingly) than stations A and B located closer to the communication channel with the sea (1.58 to 16.54 mg/g; 1.51 to 4.99 μg/g; 3.00 to 11.89 μg/g). A gradient similar to this could be seen in the silt-clay distribution with C, E, F and G having the highest percentage (62.25 to 78.41%) followed by D (43.56%), with A and B consistently the lowest (10.07 and 39.80% correspondingly). Detailed information on the environmental parameters referred to above has been given by DOUNAS & KOUTSOUBAS (1996). Hydrocarbon concentrations in the surface sediments ranged from 7.9 to 20 μg/g for the n-alkanes and from 60 to 250 ng/g for the polynuclear aromatic hydrocarbons, with lower values obtained from the innermost stations (st. D, E, F and G). Hydrocarbon concentrations in tissue of individuals of the bivalve species *Tapes decussatus* were lower than 1.5 μg/g for the n-alkanes and 60 ng/g for the polynuclear aromatic hydrocarbons.

Faunal composition

A total of 23 gastropod and bivalve mollusc species, composed of over 16 628 individuals, were identified from Gialova lagoon during the four sampling periods over summer 1995 to spring 1996 (Table 1). All the species are *marine/estuarine* species (Table 1) as identified by BARNES (1994) while specifically *lagoonal* species of marine ancestry are lacking.

Special reference should be made to two of the mollusc species found in Gialova lagoon namely: *Placida viridis*, a tiny ceratiform sacoglossan opisthobranch belonging to the family Stiligeridae found in station D and *Polycerella emertoni* a nudibranch opisthobranch of the doridacean family Polyceridae found in station C, which are reported for the first time as elements of the molluscan fauna of the Greek seas and the Eastern Mediterranean respectively. Six more species [*Jujubinus montagui*; *Rissoa aartseni* Verduin, 1985; *Alvania beani*; *Pusillina radiata*; *Hydrobia acuta* and *Aplysia depilans*] are reported for the first time from the Ionian Sea.

Zoogeographical categories to which the mollusc species are assigned are presented in Table 1. The dominant components of the molluscan fauna, in terms of number of species, are the Atlanto-Mediterranean and the Mediterranean endemics accounting for 43.5% and 39% respectively, followed by the Boreal (13%) and the Cosmopolitan ones (4.5%).

Molluscs were among the most abundant taxa, accounting for 28% of the total number of macrofaunal species (polychaetes accounted for 39% and crustaceans 26% – DOUNAS & KOUTSOUBAS, 1996). Mean density, estimated from the four sampling periods, was 2 969 individuals/m^2, while mean dry biomass was 0.3 g/m^2. Total species number ranged from 14 in st. A (June) to 1 in st. G (September). June was the sampling period with the highest total number of species and density (19 and 6 584 individuals/m^2 correspondingly) and September with the lowest with 8 species and 1 013 individuals/m^2 (Table 2).

Among molluscs, gastropods dominate in species number (18 *vs* 5 of bivalve species), and average density (1 524 individuals/m^2 *vs* 1 446 individuals/m^2), while mean dry weight biomass was equally distributed in the two taxa (0.15 g/m^2). Nine of the species (*Bittium reticulatum, Cerithium vulgatum, Cerithium rupestre, Pirenella conica, Hydrobia acuta, Cyclope neritea, Cerastoderma glaucum, Abra ovata* and *Tapes decussatus* representing 39% of the total number of species, were present throughout the year. However, it should be mentioned that the first three of the species referred to above, along with *Cyclope neritea* and *Tapes decussatus*, are represented by very few individuals (less than 10-100 per species depending on the season) and are not distributed in the innermost stations E, F and G.

Considering feeding types, the herbivores (scrapers and browsers) dominate in terms of number of species (Table 1). However, when only the dominant species, in terms of density and presence throughout the year, are taken into consideration, suspension feeders and herbivores are almost equally represented.

Structural analysis

Total number of species (s), mean density (D), species richness (d) and diversity (H') calculated for the entire lagoon in the four sampling periods (Table 2) show the same seasonal pattern: an abrupt decrease from the summer (18 species) to the autumn (9 species) being followed by a gradual increase observed in the winter and spring sampling periods. As far as the spatial pattern of the sampling stations is concerned, higher values of H' and d were obtained in stations near the sea inlet (2.08 by 1.11) and lower values in the innermost stations (0 by 0).

TABLE 2

Seasonal changes in molluscan diversity and density over the sampling period in Gialova lagoon.

	Tot. No of Species	Average density	Richness (d)	Shannon (H' log2)
Summer	19	6 584	1.16	2.35
Autumn	8	1 013	0.54	0.73
Winter	10	1 169	0.69	1.27
Spring	12	3 110	0.76	1.57

Multidimensional Scaling ordinations and cluster analysis of the stations applied to each sampling period (Fig. 2) defined two main groups of stations: A first group composed of st. A and B and a second one composed of st. E, F and G. Stations C and D are clustered either in the first or second group depending on the season. ANOSIM tests showed that the aforementioned groups are significantly different (global R superior to 0.8 – except spring, 0.6 – at a significance level less than 5%).

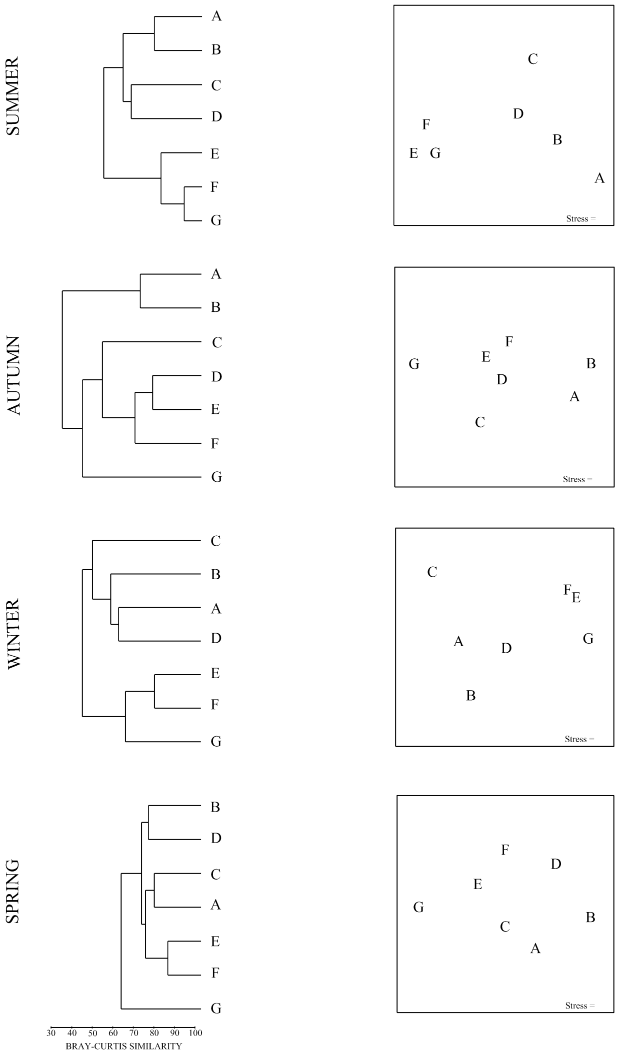

Fig. 2. – Similarity dendrograms and MDS ordination plots of stations in Gialova lagoon.

The two main groups of the above-mentioned stations showed different species composition: *Bittium reticulatum, Cerithium vulgatum* and *Cyclope neritea*, were the most abundant species in stations linked mainly with the sea inlet (A, B); *Pirenella conica*, and *Cerastoderma glaucum* were the most abundant species in the innermost stations (E, F, G).

Environment-Community interactions

The highest values of the harmonic Spearman coefficient between abiotic variables and the similarity matrices of biotic data (BIO-ENV analysis) are summarised in Table 3. BIO-ENV values exceeded 0.8 (except in spring - 0.4) thus indicating positive relationships between the multivariate pattern of the molluscan faunal density and the measured environmental variables. Different combinations of environmental variables were found associated with the multivariate pattern of the molluscan community in the four sampling periods. Only distance from the channel was among those found to be correlated with the distribution pattern throughout the year except during winter.

TABLE 3

Environmental variables best correlated with the molluscan community during the four sampling periods in Gialova lagoon (D: dist. mar. chan; T: temp.; S: salin.; O: diss. oxyg.; Eh: redox potential; MD: med. diam.; sc: silt-clay %; C: POC; F: phaeopigments; N: nitrates; N1: nitrites; ρw: weighed Spearman rank coefficient).

	D	T	S	O	Eh	pH	MD	sc	C	F	N	N1	ρw
Sum	+	+			+			+		+			0.87
Aut	+		+				+		+				0.85
Win					+	+						+	0.80
Spr	+	+		+		+	+				+	+	0.40

DISCUSSION

Despite its small size and average depth Gialova supports a rather rich, in terms of number of species, molluscan community when compared with other Mediterranean lagoons [e.g. Étang de Prévost (23 species) – Guelorget & Michel, 1979; Mer des Bihans (47) – Zaouali, 1975; Marsala (23) – Cattaneo-Vietti & Chemello, 1991; Mesologhi (46) – Nicolaidou et al., 1988; Bardawil (14) – Barash & Danin, 1982].

Taking into consideration Bianchi's (1988) classification of Italian lagoons, in relation to their climatological, hydrographic and biological features, Gialova lagoon could be assigned to the category of the "eumediterranean lagoons" as far as the mollusc composition is concerned, since Atlanto-Mediterranean and Mediterranean endemic species with a temperate and sub-tropical affinity dominate over those with a Boreal affinity.

Molluscs from brackish lagoonal waters in the Mediterranean are known from several studies (e.g. Amanieu et al., 1977; Barash & Danin, 1982; Bourgoutzani & Zenetos, 1983; Torelli, 1983; Nicolaidou et al., 1988). However, certain families or even orders of molluscs such as opisthobranch gastropod molluscs, are often ignored and there have been rather few systematic investigations of these animals in this habitat (Cattaneo-Vietti & Chemello, 1991 and references therein); the list of molluscs that can indeed live in this peculiar habitat can be considered as far from complete. The opisthobranch species *Placida viridis* and *Polycerella emertoni* prior to being found in Gialova lag0oon had once again been reported as lagoonal inhabitants (Fusaro lagoon – Schmekel, 1968). The presence of the aforementioned species in Gialova lagoon confirms the opinion of Cattaneo-Vietti & Chemello' (1991) – based on studies conducted in the western part of the Mediterranean – that these species can withstand the considerable fluctuations of the environmental variables, often occurring in these coastal environments, thus including lagoons in their ecological distribution.

Placida viridis and *Polycerella emertoni* are reported for the first time as elements of the molluscan fauna of the Greek seas and the Eastern Mediterranean respectively. Another six gastropod species found in Gialova lagoon represent new records for the Ionian molluscan fauna. These findings support previous authors' claims (e.g. Koutsoubas et al., 1997; Zenetos, 1997) that the marine biodiversity in Greek waters will become even more rich when studies are extended to cover neglected geographical locations or habitats and contribute to the overthrow of the "impoverished Eastern Mediterranean theory" expressed earlier in this century (e.g. Pérès, 1967).

Most of the mollusc species found in Gialova have been also recorded in various substrate types and assemblages, such as soft substrate without or with the phanerogames *Posidonia* and *Cymodocea* (SGCF, SVMC, SFHN, HP assemblages), on hard substrate with photophilic algae or associated with sponges, anthozoans and other organisms (AP assemblage). However, the dominant species in this lagoonal ecosystem can be characterised as typical of brackish lagoonal waters (euryhaline and eurythermal assemblages in brackish waters – Pérès, 1967; Augier, 1982). These species are distributed over the major part of the lagoon throughout the year. Species in this second category have also been recorded in estuaries (McLusky, 1981; Kevrekidis et al., 1996) and other marine environments (Koutsoubas et al., 1997; Zenetos, 1997).

On the basis of the multivariate pattern of the molluscan density, two main zones can be distinguished: a first narrow zone represented mainly by stations A and B and influenced mostly by the sea and a second one in the innermost part of the lagoon, represented by stations E, F and G. A third transitional zone is clearly apparent only during summer. Following the *confinement scale* proposed by Guelorget & Perthuisot (1992) the first zone can be assigned to the "zone III" and the second to "zones IV-V".

Number of species, density, diversity indices and multivariate analysis reveal the same seasonal distribution pattern of the molluscan community, ranging from a well stratified and rich community in summer to an impoverished one in autumn, apparently due to a "dystrophic crisis" episode occurring in the lagoon during late summer (Dounas & Koutsoubas, 1996). These crises, however have been considered as a natural reaction of the lagoonal habitat to extreme environmental conditions (mainly anoxia) and are of great importance in the re-establishment of the ecological balance (Cammete, 1992; Guelorget & Perthuisot, 1992). Similar seasonal patterns have also been observed in other Mediterranean lagoons (Amanieu et al., 1977; Gravina et al., 1989; Arias & Drake, 1994; Lardicci et al., 1997). In the subsequent seasons, mollusc species in the Gialova lagoon gradually approached the previous summer levels.

Many environmental variables have been reported to be correlated with the temporal and spatial distribution pattern of the molluscan communities in lagoonal systems. These are either clearly physical ones (e.g. salinity – Barnes, 1980) or variables involved with food supply (e.g. nutrients, organic material – Gray, 1981; Nixon, 1982; Gravina et al., 1989). Based on the molluscan zonation and on the results of the BIO-ENV analysis the Gialova lagoon illustrates the role of the *confinement*, which is determined by the time of renewal with elements of marine origin at a given point of the lagoon (Guelorget & Perthuisot, 1983). The innermost part of the lagoon has always a different faunal composition in comparison with the areas close to the sea inlet. Additionally the stations with the least contact with the sea support higher abundance and biomass values due to the large number of individuals mainly of the gastropod species *Hydrobia acuta, Pirenella conica* and the presence of large sized individuals of the bivalve species *Cerastoderma glaucum* and *Abra ovata*. A similar *coenocline* has been observed in Gialova lagoon for other animal groups (e.g. polychaetes – Arvanitidis et al., 1999) and for the whole macrobenthic community (Koutsoubas et al., 2000). However, when the succession of the *coenocline* of the molluscan community over the four seasons is compared with the ones derived either from the polychaete or the whole macrobenthic community, different aspects are revealed. The molluscan community appears to recover from the effects of the "dystrophic crisis" episode earlier than the rest of the macrobenthic faunal community, i.e. in winter instead of spring. This should be probably attributed to the fact that, despite the molluscan community being less speciose in comparison with other taxocommunities (e.g. polychaete community), it is better adapted for living in this type of coastal ecosystem. Hence, at least some of the dominant mollusc species in Gialova lagoon can better withstand the "natural stress" during the "dystrophic crisis" and take advantage of food availability aided by their bioturbation activities (e.g. *Cerastoderma glaucum* – Pelegri & Blackburn, 1995). This is further supported by the fact that food supply (e.g. organic material) has been found to be correlated with the molluscan community pattern even during summer and autumn, when other environmental variables (e.g. temperature, salinity, oxygen availability in the sediment) produce strong gradient along the lagoon and act as thresholds to the distribution of species belonging to other taxa (Koutsoubas et al., 2000).

The hydrocarbon concentration values for both sediments and bivalve molluscs found in Gialova lagoon during 1995-96 fall within the range of those reported from other non-polluted coastal areas of the Mediterranean (UNEP, 1988). Therefore, it could be concluded that the molluscan community in Gialova lagoon does not seem to have suffered the effects of any unnatural long term disturbance due to oil pollution from the "Iliad" incident, as opposed to what has been reported in similar incidents in open coastal ecosystems in other areas of the world (ELMGREN et al., 1983). The short period of recovery in Gialova lagoon from the impact of anthropogenic activities, is further supported not only by the rich molluscan diversity revealed in this study but also by the high overall macrofaunal diversity (DOUNAS et al., 1998).

Results from this study along with the results of the multi-disciplinary study investigating the structure and functioning of Gialova lagoon (DOUNAS & KOUTSOUBAS, 1996), have revealed that, despite suffering various anthropogenic activities in the past, this lagoon still constitutes a wetland of particular value in many respects (cultural, fisheries, etc.) and acts as a "biological reservoir", which should be conserved and managed in the future so as to continue to provide significant habitats for organisms in the area.

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