MESOZOOPLANKTON COMMUNITY STATE ALONG THE ROMANIAN BLACK SEA COAST IN 2009

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ABSTRACT

This paper presents the results obtained in the framework of the national research project PN09-320202 and the National Marine Environmental Monitoring Program. The qualitative and quantitative state of the mesozooplankton population along the Romanian Black Sea coast is presented on the basis of 131 zooplankton samples collected from February to September 2009, highlighting the recent recovery trends recorded under the current general improvement state of the marine ecosystem.

KEY WORDS: mesozooplancton, Romanian Black Sea coast, ecological recovery

INTRODUCTION

Research carried along the Romanian Black Sea coast in the past 50 years highlighted major changes in the qualitative and quantitative composition of the biotic marine environment. An important role in identifying these changes had the studies undertaken at the mesozooplankton level. The purpose of this paper is the continuation of this long process of accumulation and analysis of data used to accurately depict the evolution of the mesozooplankton component of the marine ecosystem.

Following research carried out between 1960 and 1975 in the marine areas in front of Constanta city, the maximum values for abundance and biomass were recorded during the summer months and the mesozooplankton was dominated by two groups Cladocera and Copepoda, out of which the first could reach up to 80 % of the total biomass and abundance (in particularly represented by the species *Penile avirostris*), (PETRAN, 1968, 1976, 1997).

The situation started changing between 1979 and 1986 when eutrophication began to manifest more at the Romanian coast, a phenomenon that has produced dramatic changes in qualitative and quantitative structure of mesozooplankton. At first there was an increase in zooplankton biomass and abundance but at the same time the mesozooplankton diversity started to fall, as hiponeustonic more sensitive species to pollution disappeared while others like *Centropages ponticus* or *Penile avirostris* drastically reduced their populations. Resistant species to new environmental conditions such as *Acartia clausii* or *Pleopis polyphemoides* have proliferated (PETRAN and IALINA, 1981; PETRAN, 1997).

Between 1987 and 1999 fodder mesozooplankton quantities started to decrease due to proliferation of gelatinous organisms such as *Aurelia aurita* and cistoflagelat *Noctiluca scintillans*, but also because of the occurrence of ctenophore *Mnemiopsis leidyi* (PETRAN, 1996/1997, 1997; PETRAN and MOLDOVEANU, 1994/1995, 1999; MOLDOVEANU and TIMOFTE, 2004).

After 2000, once with the apparition of ctenophore *Beroe* in the Black Sea pelagial and overall reduction of anthropogenic pressures, mesozoopalankton structure begins to resemble more to that of the period 1960-1970 (MOLDOVEANU and TIMOFTE, 2004). Best example is the situation recorded in summer 2009, when mesozooplankton population presented same characteristics as in the earlier period mentioned above.

MATERIAL AND METHODS

Zooplankton samples were collected in five expeditions organized in February, May, June, July and September, 2009. The total 131 samples were collected from 10 profiles covering the whole Romanian coast from north to south and from shore up to 50m water depth (Fig. 1). Sampling was done using a JUDAY net (36 cm diameter and 150 micron mesh filter), in standard layers 2-0m, 10-0 m 25-10 m and 50-25 m. After collection samples were preserved with formalin (4% concentration in the sample) and stored in jars of 500 ml. Sampling processing was carried out in accordance with "*Manual for zooplankton sampling and analysis in the Black Sea Region*".

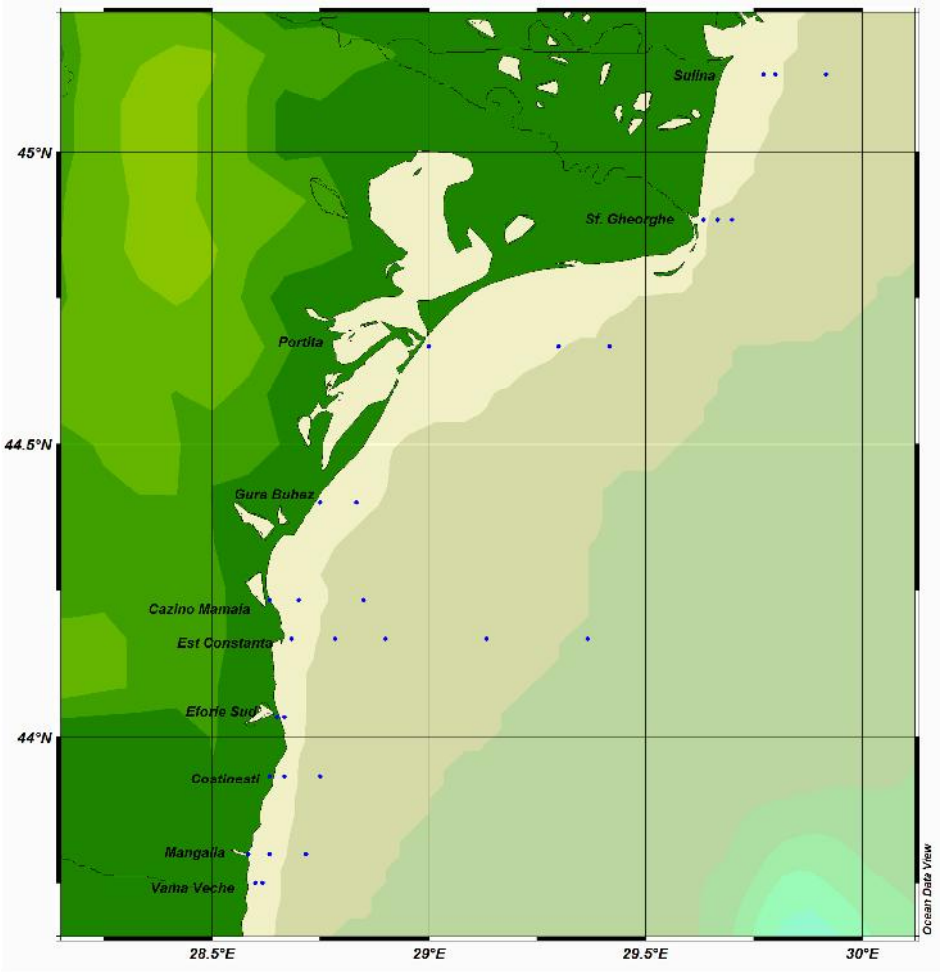


Fig. 1 – Map of sampling profiles and stations along
Romanian Black Sea coast in 2009

RESULTS AND DISCUTION

During February-September 2009 quantitative and qualitative structure of zooplankton varied in very wide limits, with lower values in winter and spring and significantly higher values in summer and autumn (Fig. 2). Thus, in spring minimum values for abundance (191 ind./m^3) and biomass (5.43 mg./m^3) and in summer the maximum ones (407,363 ind./m^3 and 11,410. 61 mg./m^3) were recorded.

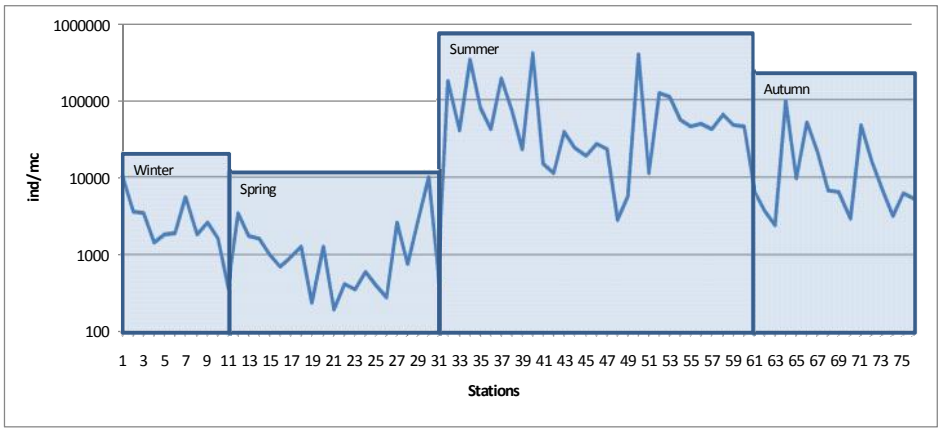


Fig. 2 – Seasonal abundance along Romanian Black Sea coast in 2009

Winter

Winter mesozooplankton (according to samples collected in February) was represented by 12 taxa. Maximum values for abundance and biomass were recorded in front of Mangalia in station 1 (10,135 ind./m^3 and 196 mg./ m^3, respectively) (Fig. 3). During this period copepods represented up to 77% and 70%, respectively of the total mesozooplankton abundance and biomass (Fig. 4).

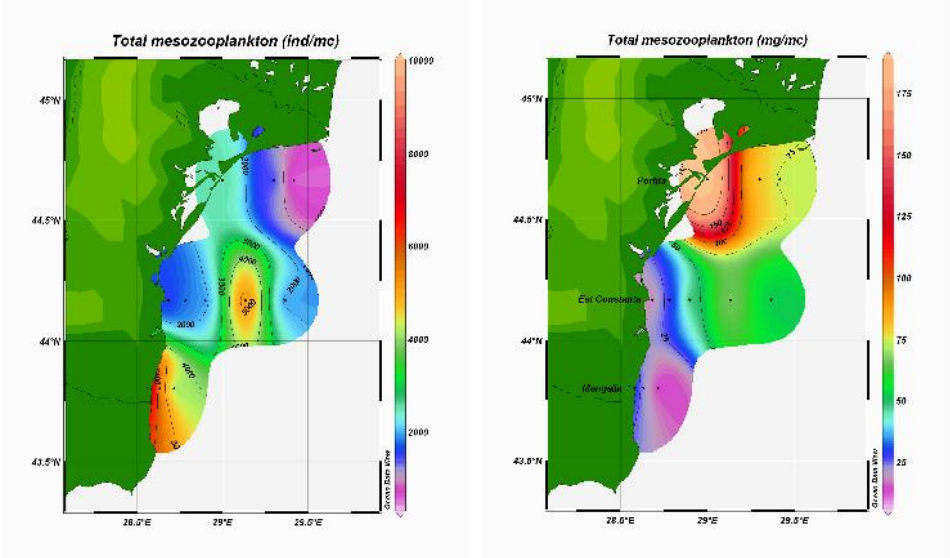
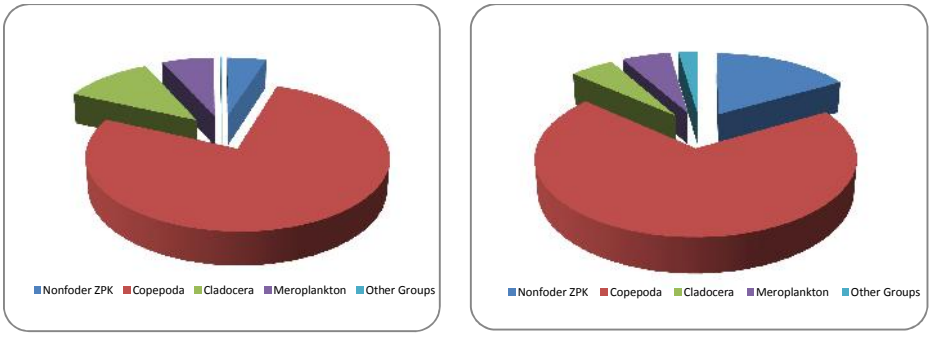


Fig. 3 – Mesozooplankton abundance and biomass distribution along Romanian Black Sea coast in February 2009



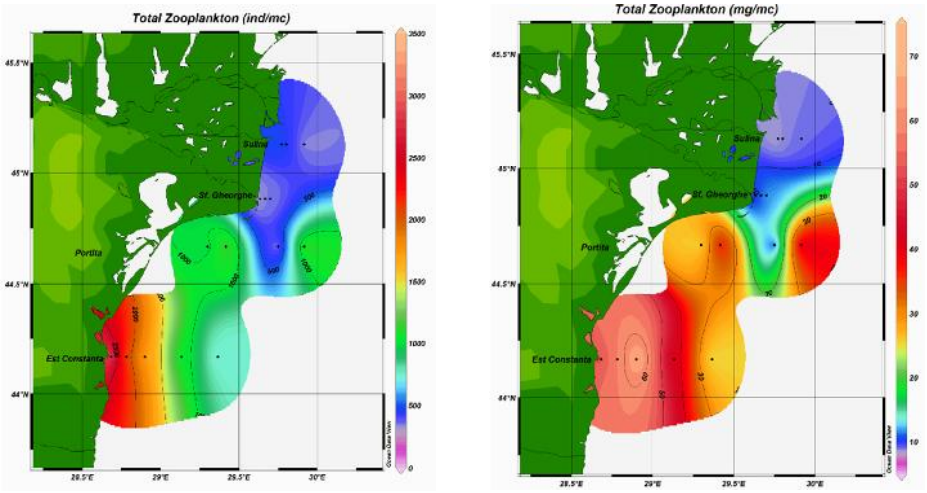
Adundance Biomass

Fig. 4 – Mesozooplankton composition in February 2009

A remark for this period is the high number of cladocerans *Pleopis poliphemoides* and *Evadne spinifera* which are more characteristic, especially *the* second one, for the wormer period.

Spring

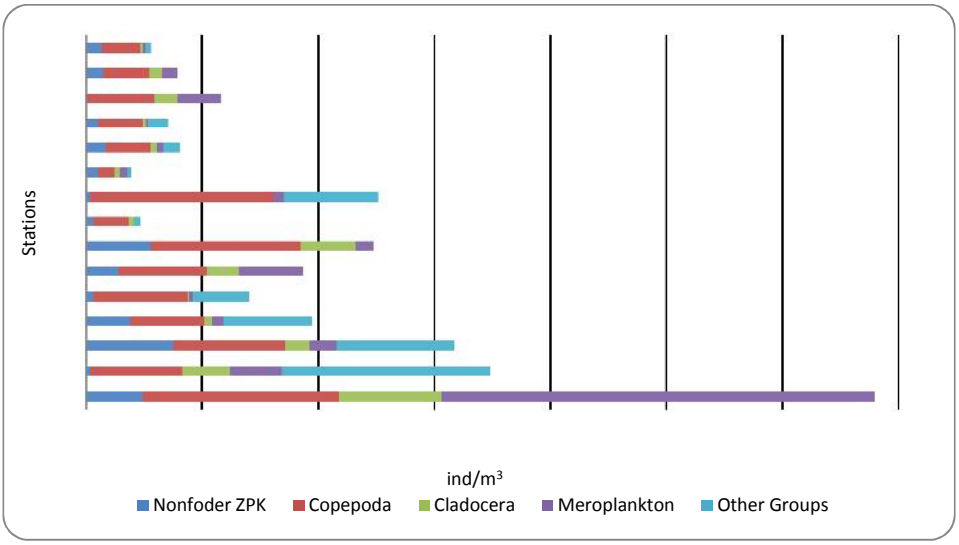
This season is characterized by (a set of 31) samples collected in May. During this period, the qualitative structure of the mesozooplankton is represented by 15 taxa pertaining to 11 taxonomical groups. The lower value for mesozooplankton was recorded in front of the Danube Delta due to high fresh water inflow and reduced salinity and temperature recorded in this area (Fig. 5).



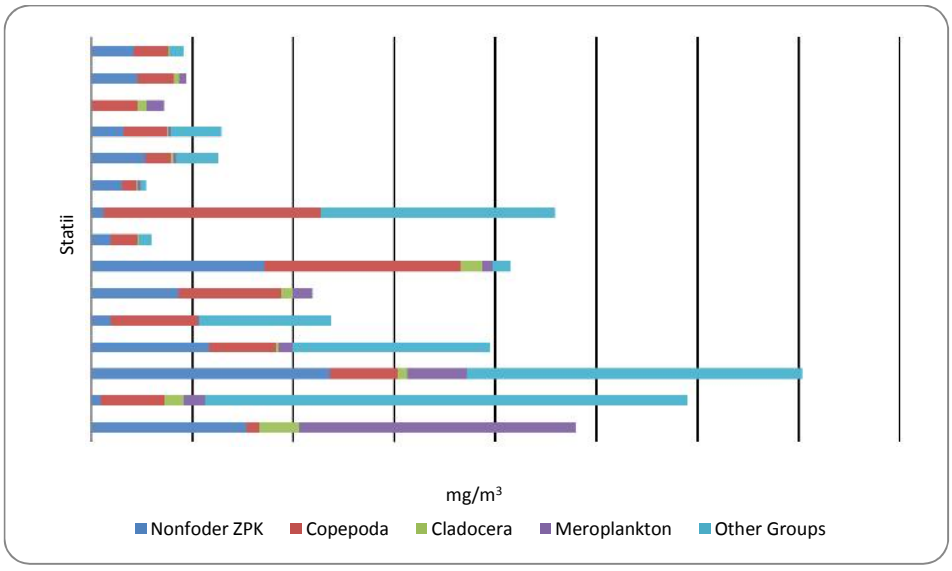
Abundance **Biomass**

Fig. 5 – Mesozooplankton distribution along
Romanian Black Sea coast in spring 2009

Quantitative structure of mesozooplankton in this period was dominated by three groups: copepoda, meroplankton and “other groups” (mainly represented by apendicularian *Oikopleura dioica* with high biomass value) (Fig. 6).



Abundance



Biomass

Fig. 6 – Mesozooplankton distribution during spring 2009

Summer

Summer of 2009 is characterized by two sets of samples collected in June (11 samples) and July (41 samples). This season peculiarity means a high contrast between the two months, June with very high quantities of nonfodder mesozooplankton and July with a very good mesozooplankton structure and composition where the nonfodder mesozooplankton registered its lowest value. The peak of abundance and biomass for fodder mesozooplankton was also registered in this season (July). Number of taxa identified ranged between 14 in June and 22 in July.

June

It was characterized by high values for abundance and biomass of nonfodder mesozooplankton represented by the cistoflagelate *Noctiluca scintillans* (Fig. 7). Maximum abundance (37,787 ind./m^3) and biomass (3236.2 mg./m^3) of *Noctiluca* was registered on station 4 of Est Constanta profile in the layer 10-0m where the lowest value for salinity and a low value for oxygen, were also registered (Fig. 8).

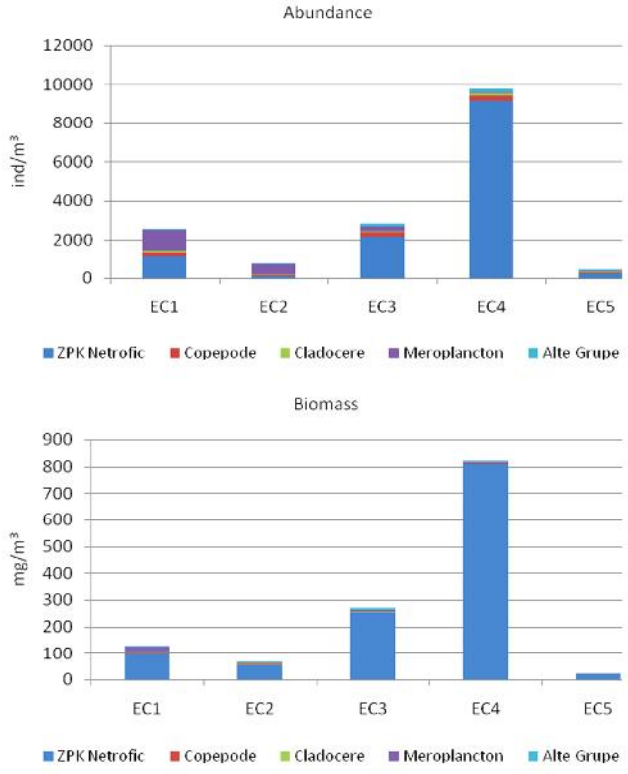
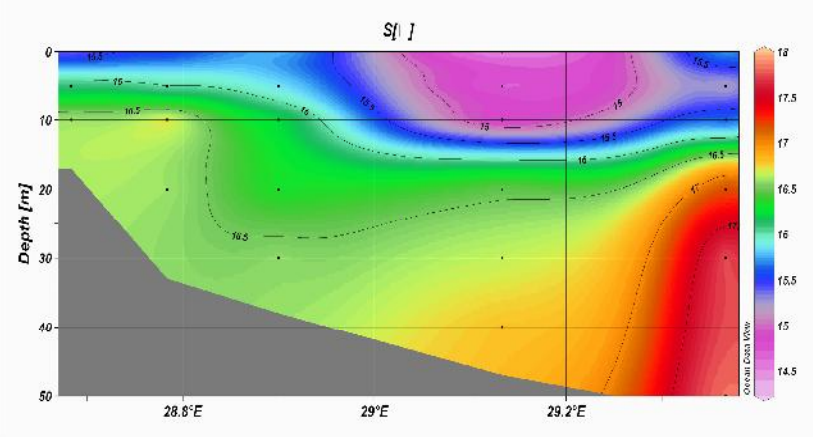


Fig.7 – Mesozooplankton distribution along Est Constanta profile in June 2009



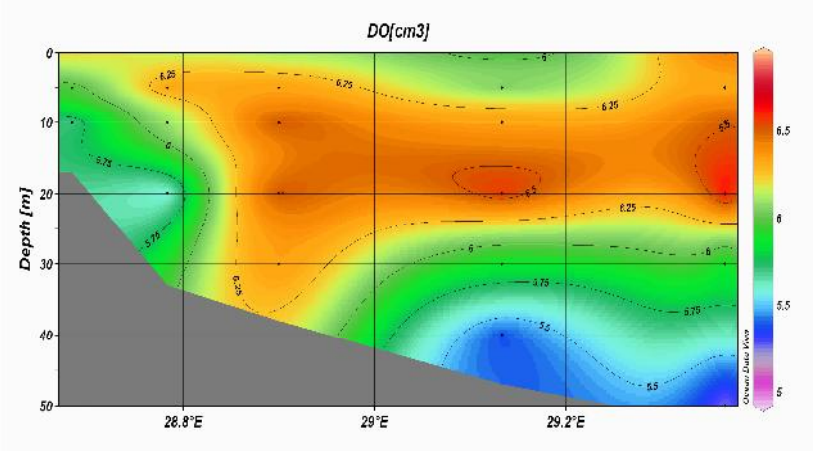


Fig.8 – Salinity and disolved oxygen along Est Constanta profile in June 2009

July

This month reflects best the current improvement trend registered along the Romanian coast at mesozooplankton level. The dominant group during this month was Cladocera (Fig. 9) represented especially by *Penilia avirostris* which registered the highest value in 2009 in station 1 of profile Gura Buhaz, 252,457 ind./m^3 (Fig. 10). This species reduced its population drastically during the eutrophication period in the past decades. Situation in July 2009 can be compared to those recorded at the Romanian coast during the summers of 1960 to 1975.

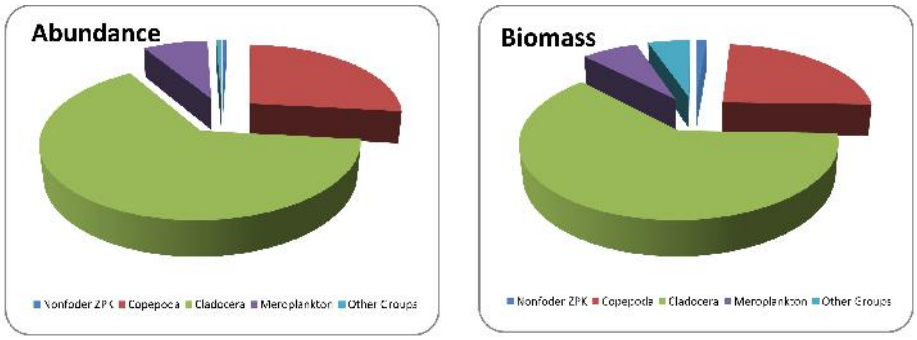


Fig. 9 - Mesozooplankton composition in July 2009

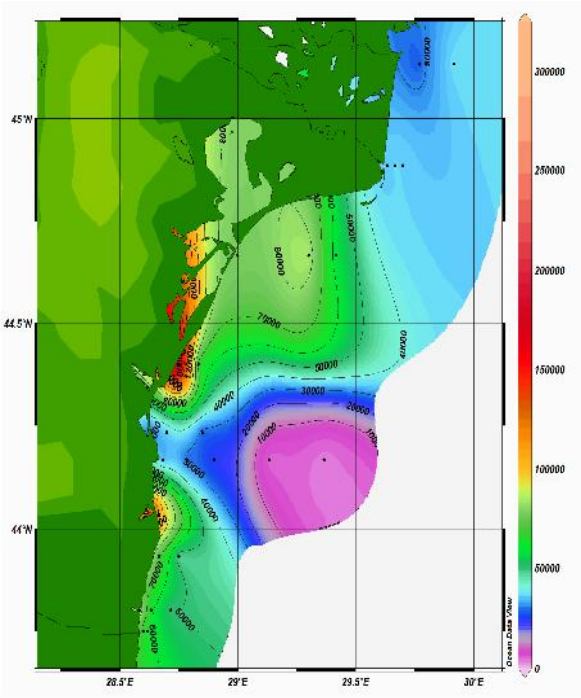


Fig. 10 - Cladocera abundance (ind./m^3) distribution in July 2009

Autumn

The highest number of taxa for this year (25 taxa pertaining to 14 groups) was recorded in September. This month also present the same good improvement trend of mesozooplankton where cladocerans are still the

dominant group (Fig. 11). During this period the second mesozooplankton abundance and biomass peak of the year is registered (Fig. 12), comparable to the situation registered before the eutrophication period.

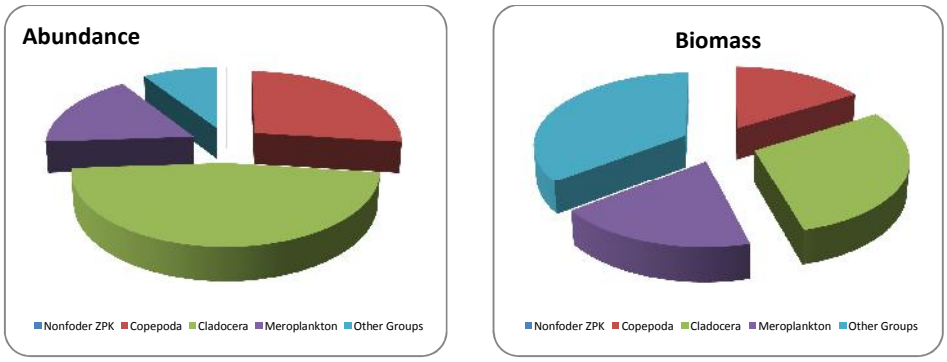


Fig. 11 - Mesozooplankton composition in September 2009

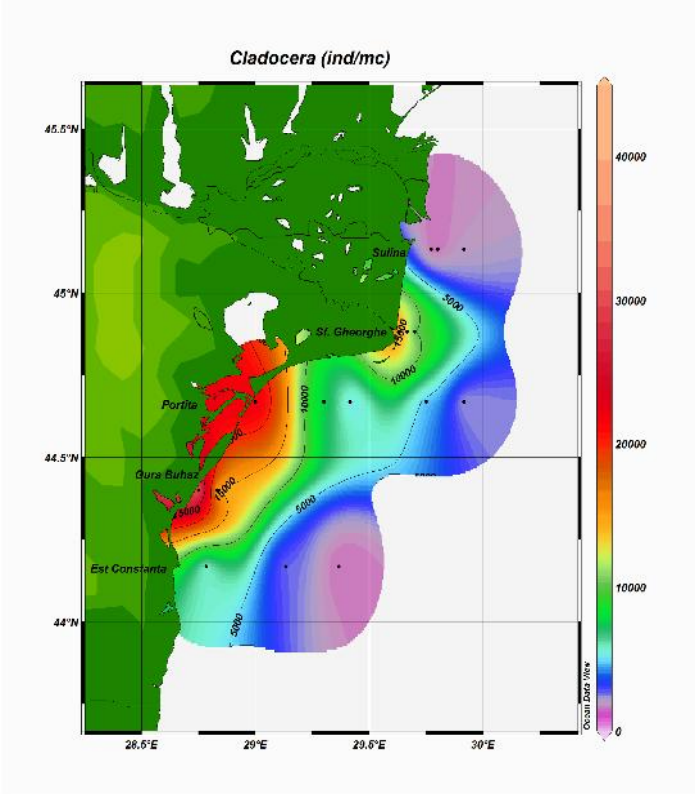


Fig. 12 - Cladocera abundance (ind./m^3) distribution in September 2009

CONCLUSIONS

In 2009, 26 taxa belonging to 15 taxonomic groups have been identified.

Qualitative structure of mesozooplankton starts to show signs of improvement in all seasons, presenting an even distribution of biomass and abundance among component groups.

In 2009 mesozooplankton presented a normal evolution with summer and autumn peaks an dlower values in winter and spring (Fig. 2).

Rare species during the past decades like copepod *Centropages ponticus* and cladocerans *Penile avirostris, Evadne spinifera* and *Pseudevadne tergestina* registered more abundant populations (maximum 252,457 ind./m^3 registered by *Penilia* in July is the highest value ever recorded by this species or the cladocera group at the Romanian coast). Thus in summer and autumn the dominant group was the cladocera, which represented up to 65% of the total mesozooplankton abundance, a similar situation to that recorded in the period 1960-1970.

The improvement signs of the mesozooplankton starts to appear since a few years already but with more and more clear trends during the last three.

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