

QUANTITATIVE AND QUALITATIVE EVALUATION OF ZOOBENTHOS IN THE ROSCI0066 DANUBE DELTA - THE MARIN AREA SITE – A CASE STUDY IN VERNAL SEASON 2012

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Abstract

Zoobenthos plays an important role in the proper functioning of aquatic ecosystems. Benthic animal organisms may have a role in filtering water, remineralisation of the organic matter but also can be used as feed for fish or human food. To assess the qualitative and quantitative structure of zoobenthos in ROSCI0066 site, in vernal season 2012, benthos sampled were taken on sedimentary substrate at depths between 8 m and 18 m, with Van Veen bodengreif. The species were identified up to species level or group and for quantitative analysis the individuals were counted simultaneously with the sorting and their identification. Density was expressed in individuals per m^2 and biomass in $g\ m^{-2}$. In vernal season 2012, in ROSCI0066 site have been identified 20 species of benthic invertebrates, mostly polychaetes (50%), followed by mollusks (bivalves and gastropods) (40%), crustaceans (5%) and other groups (5%). In quantitative terms, the values of zoobenthos density and biomass showed variations ranging from a minimum density of 50 individuals m^{-2} (Mila 9) and a maximum of 2575 individuals m^{-2} (Periboina) or a minimum biomass below $1\ g\ m^{-2}$ (Sulina, Mila 9 Perisor) and maximum of $530\ g\ m^{-2}$ (Periboina). Compared with the previous year, in the ROSCI0066 Danube Delta - the Marin Area site is recorded a decrease of the number of zoobenthos species from 36 to 20 species.

Keywords: biomass, density, Natura 2000, sites.

1. INTRODUCTION

ROSCI0066 is a protected natural area in the national network and also a Ramsar and Unesco site, which corresponds to the geographical unit from the Danube Delta Biosphere Reservation and the Black Sea coast, at the mouth of the Danube - Chilia channel to Cap Midia, to the South, and up to 20 m isobath, to the East (Figure 1).

The inventories of species that inhabit in specific habitats of ROSCI0066 site provide a concrete image of their conservation status. Based on the results, it may take appropriate management measures and halting the loss of biodiversity and preservation of natural resources in a Natura 2000 protected marine area. By adequate measures can be perform both protection of the natural environment, as well as the conventional livestock by organic farming (Raducuta, 2011).

Zoobenthos underlies the aquatic food chain, having multiple roles in the life and work of other aquatic organisms. Thus, can filter the water, remineralize the organic matter or can be a source of food for fish and humans.

2. MATERIAL AND METHOD

In order to characterize the quantitative and qualitative structure of zoobenthos in vernal season 2012, in April have been sampled from sedimentary substrate, using the research ship "Starfish", property of the National Institute for Marine Research and Development "Grigore Antipa" of Constanta.

The zoobenthos samples have been collected using Van Veen bodengreifer type at depths ranging from 8 m to 18 m of the stations: Sulina, Mila 9, Sfantu Gheorghe, Sahalin, Zaton, Periteasca, Perisor, Portita, Periboina, Chituc, Vadu (Figure 2).

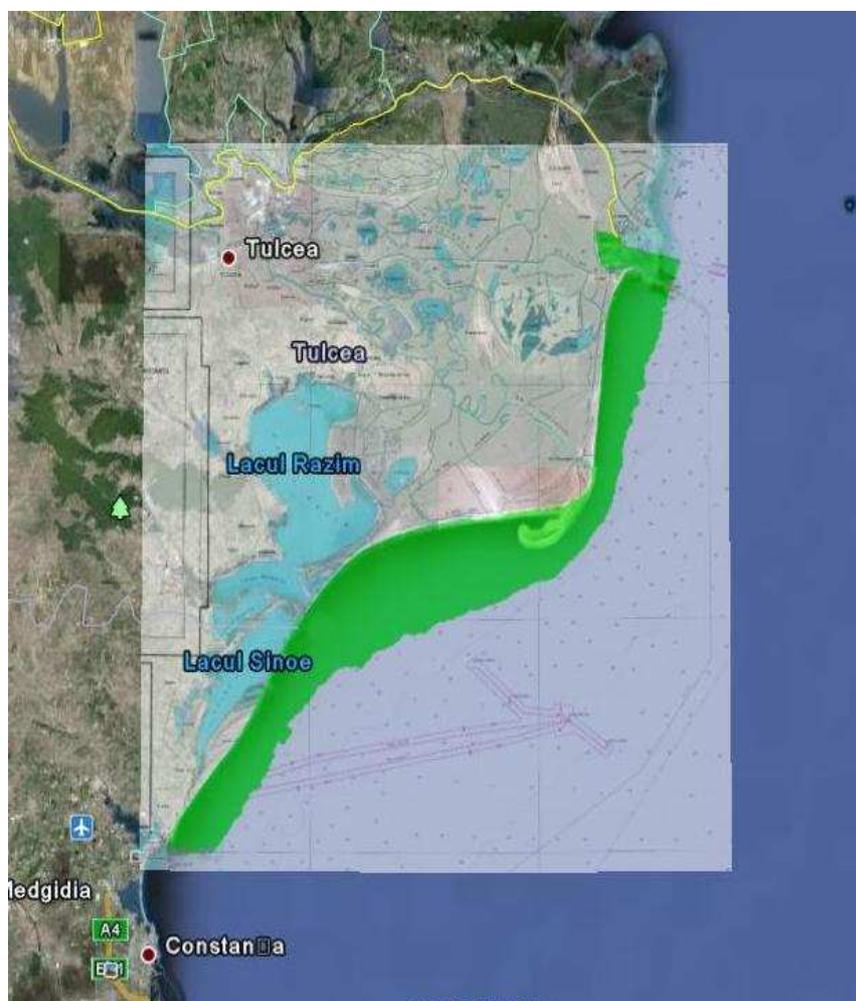


Figure 1. Location of ROSCI0066 Danube Delta - Marine Area site on the hydrographic map of Romania



Figure 2. Collection of zoobenthos samples
(Photo NIMRD / V. Maximov)

After collection, the samples were taken to the laboratory where they have been introduced in plastic bags, labeled and fixed with 4% formaldehyde. In laboratory, the zoobenthos sample have been washed and passed through sieves with meshes for particle size from 1 mm to 0.5 mm. For qualitative evaluation of benthic animals organisms were separated in groups of invertebrates: worms (polychete, nemertini), molluscs (bivalves, gastropods), crustaceans (barnacle, amphipods, cumacee, decapods etc.).

For quantitative evaluation, the individuals of each species or group were counted simultaneously with sorting and their identification. Density was expressed individuals m^{-2} and biomass in $g m^{-2}$.

Was used the wet biomass, in which case the higher organisms have been buffered with a filter paper to absorb the surface water, and weighed with a precision analytical balance and for the small organism were used weight tables (Abaza et al., 2006).

3. RESULTS AND DISCUSSIONS

From the qualitative point of view, of the total zoobenthos samples in vernal season 2012, in ROSCI0066 Danube Delta – the Marine Area site were identified 20 invertebrates benthic species, out of which 50% polychete worms, 40% molluscs (bivalves and gastropods), 5% crustaceans and 5% other groups of invertebrates (Figure 3).

Of polychete worms were predominant *Harmothoe reticulata* and *Melinna palmata* species. It was noted also as a constant presence in samples of *Nephtys hombergii*, species considered in the 1960s as an enclave in *Spisula – Mytilus* biocoenosis.

In zoobenthos samples mollusks fauna was present by 8 species, with a mixture of pelophilic and psammophilic shapes, marking the transition from sand facies at the sludge.

Present in some stations of psammophile bivalve species *Lentidium mediterraneum*, *Cerastoderma edule*, *Cyclope neritea* and pelophilic species like *Spisula subtruncata* and *Mytilus galloprovincialis* highlights the transitory nature of specific biocoenosis. In the mouths of the Danube zone the molluscs are those which characterize the biocoenosis.

In 6 of the 11 stations where were taken zoobenthos samples from the ROSCI0066 site in vernal season 2012 was highlighted the quantitative dominance of *Anadara inaequalvis* bivalve species. The structure of *Anadara* populations in marine area studied had a wide range of size classes indicating a better vitality for populations. The best represented by the diversity of size classes was on Periteaşca (12 m) and Periboina (16 m) profiles. Share of about 50% of specimens with 5-10 mm length shows a young population structure constituted of individuals growing. Regarding the gastropods, was noted fairly constant the presence of the *Hydrobia ventrosa* species and development in some stations of *Cyclope neritea* species.

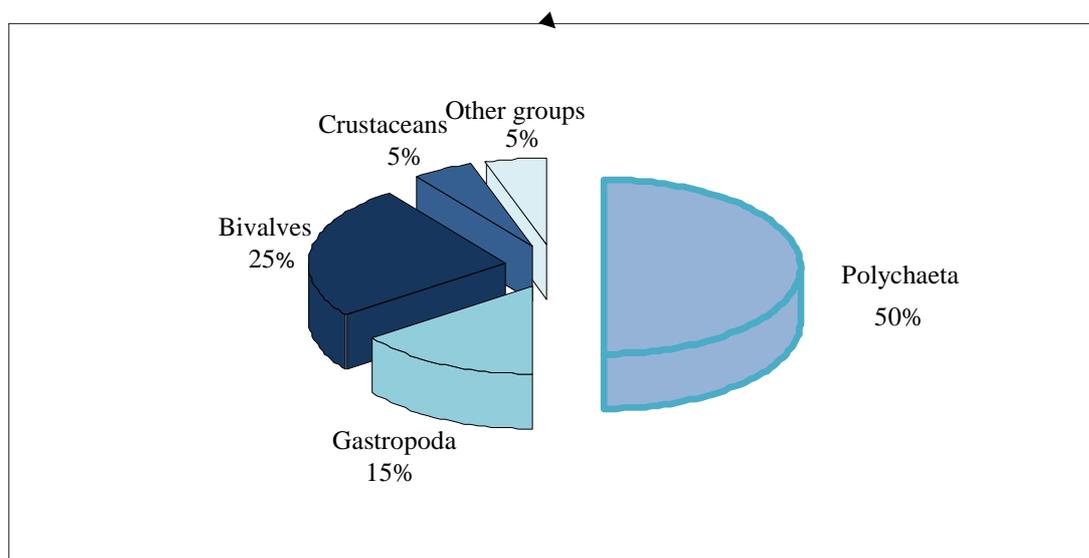


Figure 3. The structure of benthic invertebrate populations by taxonomic groups in vernal season 2012, in ROSCI0066 Danube Delta-the Marin Area site

In the ROSCI0066 site in the vernal season, 2012, was identified a single species of crustaceans, *Ampelisca diadema* amphipods.

Table 1. Number of species, density (individuals m^{-2}) and biomass ($g m^{-2}$) of macrozoobenthos, registered in ROSCI0066 site in vernal season 2012

Stations / Depth	Month	No. species	Density (individuals m^{-2})	Biomass ($0.03 g m^{-2}$)
Sulina – 16.5 m	IV	3	75	0.025
Mila 9- 18 m	IV	2	50	0.030
Sf. Gheorghe – 12 m	IV	5	375	24.560
Sahalin – 12 m	IV	2	100	28.080
Zaton – 8 m	IV	8	1115	120.260
Periteasca-12 m	IV	9	2350	189.720
Perisor – 10 m	IV	3	150	0.170
Portita – 12 m	IV	7	1875	21.050
Periboina – 16 m	IV	9	2575	530.000
Chituc – 16.5 m	IV	6	1000	76.000
Vadu – 12.5 m	IV	4	200	7.800

From the quantitative point of view, the abundance and the biomass values have a variation in the profile to another. Thus density value ranged between 50 individuals m^{-2} in Mile 9 to 2575 individuals m^{-2} in Periboina. Regarding the biomass, it had a maximum value of 530 $g m^{-2}$ in Periboina and values less than 1 $g m^{-2}$ in Sulina (0.025 $g m^{-2}$), Mila 9 (0.03 $g m^{-2}$), Perișor (0.17 $g m^{-2}$) (Table 1, Figure 4).

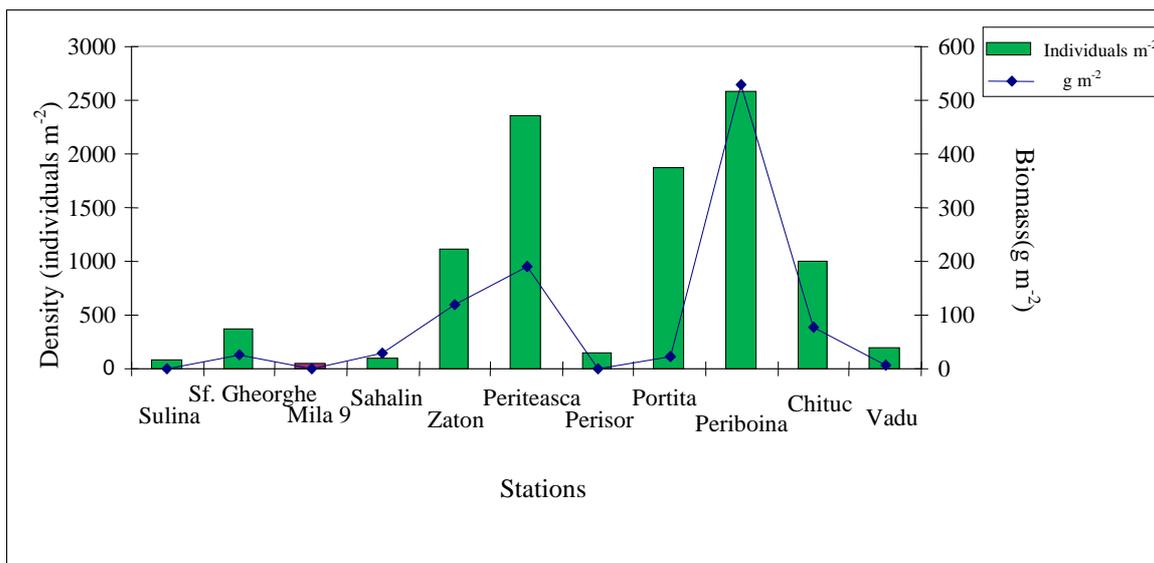


Figure 4. The distribution of quantitative values (Density - individuals m^{-2} ; Biomass - $g m^{-2}$) in the ROSCI0066 site, in vernal season 2012

Comparing the data from the vernal season in 2012, the ROSCI0066 site has indicated a situation modified from the previous assessment of the invertebrate fauna in the autumn 2011. Thus species diversity was low, the number of species reduced to 20, compared with 36 species identified at the ending of 2011.

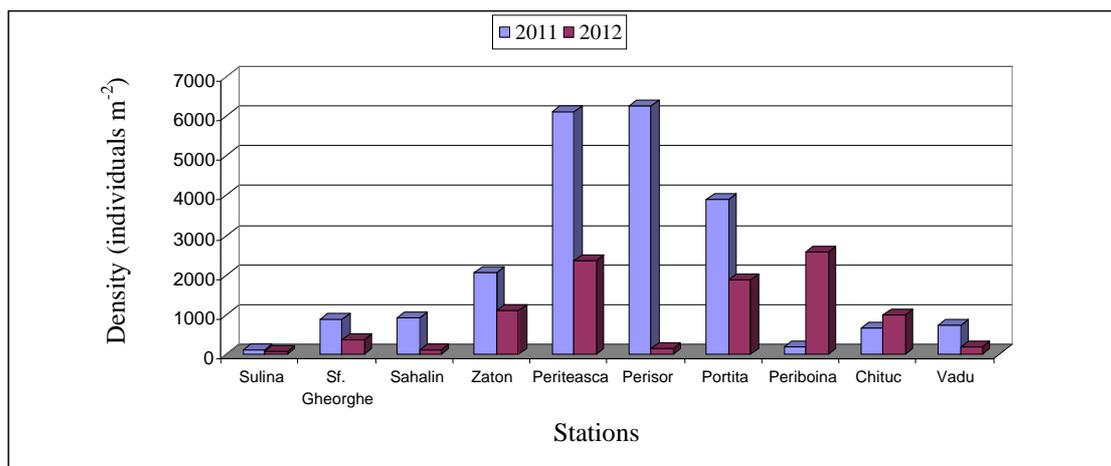


Figure 5. The evolution of macrozoobenthos densities in ROSCI0066 site, in 2011-2012

And the distribution of quantitative values (density and biomass) has been fluctuations from season to season. In 2012 recorded values up to 42 times lower in Perisor station where they were recorded low biomass under 1 g m^{-2} compared to 2011 (Figure 5, Figure 6).

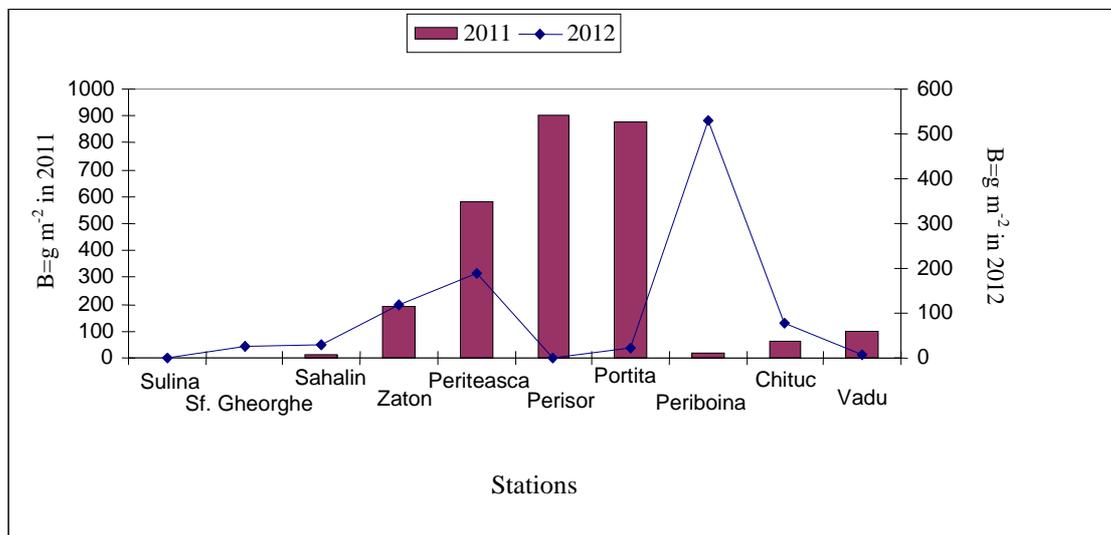


Figure 6. The evolution of macrozoobenthos biomass in ROSCI0066 site, in 2011-2012

4. CONCLUSIONS

After processing the zoobenthos samples in vernal season 2012, in the ROSCI0066 Danube Delta – the Marine Area site have found the following:

- Have been identified 20 species of benthic invertebrates, mostly polychete worm (50%), with dominant species *Capitella capitata*, *Heteromastus filiformis* and *Melinna palmata* who have had high density values on certain profiles;
- The molluscan fauna was represented by 8 species, with a mixture of forms ilio- and psamophilic forms like *Lentidium mediterraneum*, *Spisula subtruncata* and *Anadara inaequalis*;
- Opportunistic species, *Anadara inaequalis* bivalve species, was present in 6 of the 11 stations, with a population structure dominated by young individuals, which can be support to maintain balance of species in the area;
- Analysis of data from this site revealed a low diversity to 20 species in the vernal season in 2012, with fluctuations of quantitative parameters (density and biomass) compared to the previous assessment in autumn 2011, when there were 36 macrobenthic species.

5. ACKNOWLEDGEMENTS

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6. REFERENCES

- Abaza, V., Boicenco L., Bologa A.S., Dumitrache C., Moldoveanu M., Sburlea A., Staicu I., Timofte F. (2006) Biodiversity structure from the Romanian marine area. *Cercetari marine – Recherches marines, INCDM Constanta*, 36, 15-29.
- Raducuta, I. (2011) Research on the situation of agricultural land and livestock exploited in the organic system in European Union. *Scientific Papers, Series D, Animal Science, UASVM Bucharest*, LIV, 258-263.
- ***Progress Report no. 2 (2012). SOP-ENV Project, CNRS SMIS Code 17162.