CONSIDERATIONS ON THE BENTHONIC MACRO FAUNA ON THE MID-LITTORAL ROCKS IN THE MARINE RESERVE „2 MAI - VAMA VECHE" (BLACK SEA)

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ABSTRACT

The research had been carried out during 2007 – 2008 and became the subject of first author's master school final paper. The animal organisms taken into consideration form practically the epibiota of the rocks situated in the wave crashing area, in „2 Mai - Vama Veche" Marine Reserve perimeter. The paper analyses the structure and the evolution of these macro zoo benthic communities. The results are based on the processing of quantitative zoo benthic samples, and the ecological indicators evince the place that every species is placed on, in the rocky mid-littoral biocoenosis of the reserve.

KEY WORDS: macro fauna, mid-littoral, marine reserve

INTRODUCTION

In order to decipher the established relations between different species of a biocoenosis, their simple identification is obviously not enough. The complexity of these relations can only be reflected by the synecological analysis. This allows the identification of the most important species of the ecosystem, under the aspect of the energy changes with the environment they live in, which are the species that characterize one biotope and which are the ones that have accidentally arrived there, establishing also which are the relations between the different species that participate in the forming of the biocoenosis.

MATERIAL AND METHOD

For accomplishing this study, stones from five areas of the mid-littoral between 2 Mai and Vama Veche villages were collected (Fig.1), and the epibiota on those surfaces was curetted. After the withdrawing from the marine environment, the stones have been put in containers with sea water to avoid their dehydration, and then they have been taken in the lab, for processing. Here, the rocks have been well curetted, and each sample conserved in containers, with 4% formaldehyde, for ulterior processing. For the quantitative and qualitative analyses that have been done, the curetted material was passed through the granulometric screen of 1 mm. The values have been written in tables and statistically analyzed. Some important ecological indexes were calculated (abundance, dominance, constancy, ecological significance index, coenotic affinity index, ecological similarity index, etc.), that allowed, together with the graphical charts that were made, the wording of some conclusions regarding the considered biocoenosis.

Fig. 1 - The placement of the sampling areas (1 to 5) on Google Earth map

RESULTS AND DISCUSSIONS

Depending on the data obtained from the analysis of the qualitative and quantitative structure of the collected organisms from the rocky area of the Reserve (table 1), I tried to establish the role and the place of the macro benthic organisms in the *Mytilaster – Balanus – Mytilus* subcenosis.

During the study period, 14 macrobenthal species were identified, part of 5 phyllums, 7 classes and 9 orders. We present in the following figures (2 – 4) the species, class and phyllum structure of the studied biocenosis, through the abundance values.

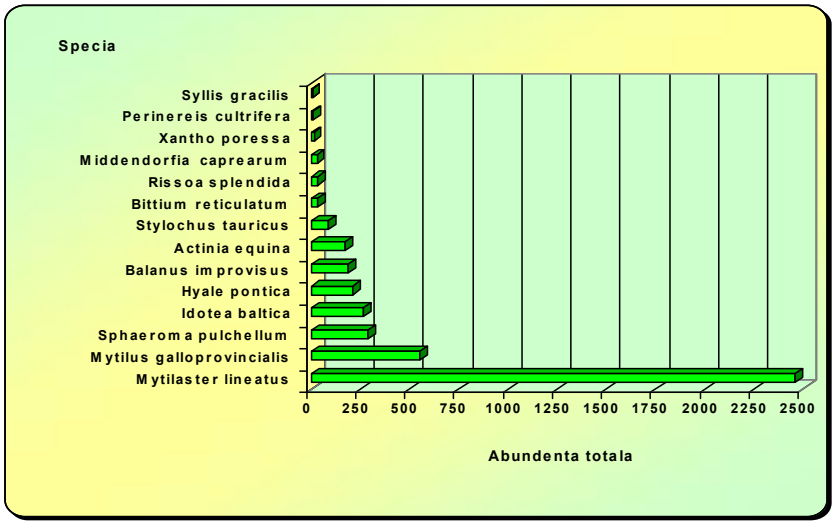

Fig. 2 - The total abundance of the species in samples

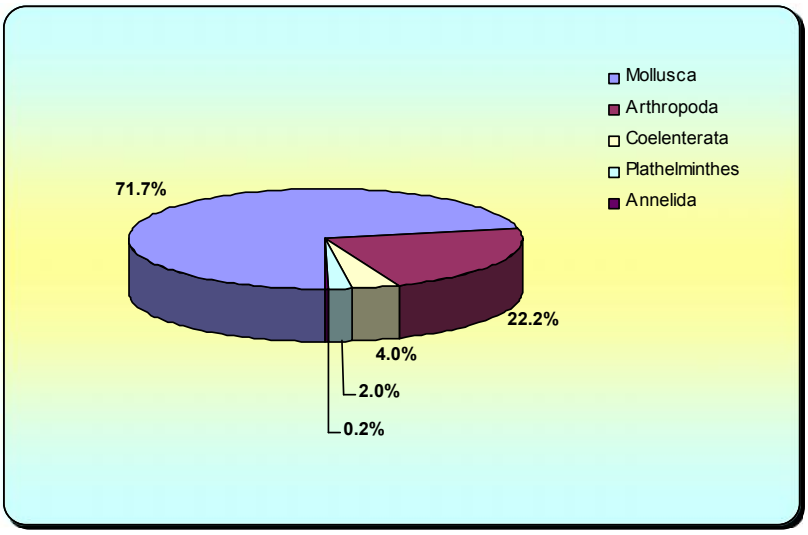

Fig. 3 - The average percentage of phylum in samples

Table 1 - The abundance of species per samples

Species	Samples														
	1			2			3			4			5		
	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c
Actinia equina	14	12	15	13	10	12	21	0	15	13	11	14	10	0	11
Stylochus tauricus	12	11	0	12	0	0	17	12	12	0	0	10	0	0	0
Perinereis cultrifera	2	0	0	1	1	0	0	0	0	0	0	0	1	0	1
Syllis gracilis	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0
Middendorfia capr.	7	8	1	4	1	0	0	0	5	0	0	0	0	0	0
Bittium reticulatum	6	8	0	0	0	0	1	10	0	0	4	0	0	0	1
Rissoa splendida	0	0	0	0	0	0	1	1	9	1	4	1	10	2	0
Mytilaster lineatus	211	145	174	148	185	154	178	163	174	144	162	108	159	148	201
Mytilus galloprov.	47	41	25	39	54	66	14	16	9	22	24	19	77	24	70
Balanus improvisus	15	17	4	10	18	7	5	19	11	12	14	7	18	13	17
Hyale pontica	27	15	8	9	11	17	14	24	17	16	0	0	24	11	14
Idotea baltica	26	24	17	25	11	10	19	15	14	10	27	26	11	10	18
Sphaeroma pulchellum	24	27	15	19	10	11	27	15	24	14	29	17	11	26	17
Xantho poressa	4	0	0	0	2	0	0	0	0	3	0	2	0	0	0

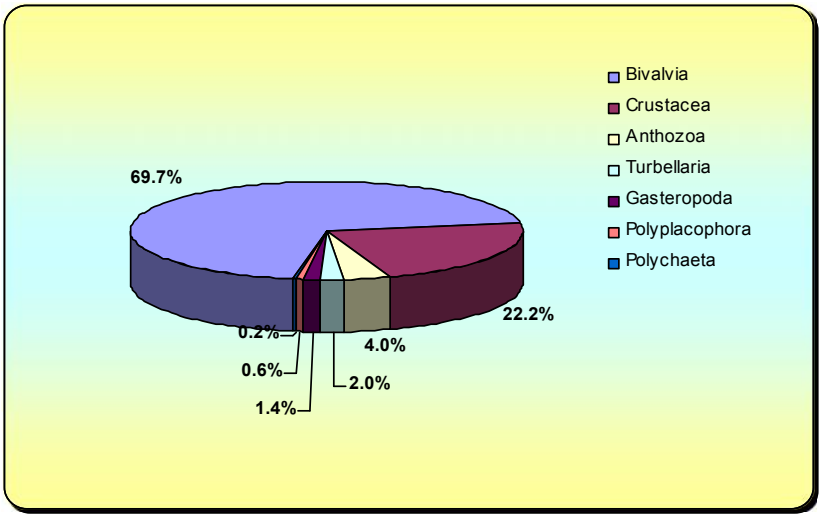

Fig. 4 - The average percentage of classes in samples

Table 2 - Quantitative structure of the macro benthos on the southern side of the South Damn of Mangalia Harbor (sampling area 1)

Species	A	D%	C%	W	Rank
Mytilaster lineatus	530	55.09356	100	55.09356	**1**
Mytilus galloprovincialis	113	11.74636	100	11.74636	**2**
Idotea baltica	67	6.964657	100	6.964657	**3**
Sphaeroma pulchellum	66	6.860707	100	6.860707	**4**
Hyale pontica	50	5.197505	100	5.197505	**5**
Actinia equina	41	4.261954	100	4.261954	**6**
Balanus improvisus	36	3.742204	100	3.742204	**7**
Middendorfia caprearum	16	1.663202	100	1.663202	**8**
Stylochus tauricus	23	2.390852	66.66	1.593742	**9**
Bittium reticulatum	14	1.455301	66.66	0.970104	**10**
Xantho poressa	4	0.4158	33.33	0.138586	**11**
Perinereis cultrifera	2	0.2079	33.33	0.069293	**12**

Table 3 - Quantitative structure of the macro benthos on the northern side of „Little Gulf" Damn (sampling area 2)

Species	A	D%	C%	W	Rank
Mytilaster lineatus	487	56.5621	100	56.5621	**1**
Mytilus galloprovincialis	159	18.4669	100	18.4669	**2**
Idotea baltica	46	5.34263	100	5.34263	**3**
Sphaeroma pulchellum	40	4.64576	100	4.64576	**4**
Hyale pontica	37	4.29733	100	4.29733	**5**
Balanus improvisus	35	4.06504	100	4.06504	**6**
Actinia equina	35	4.06504	100	4.06504	**7**
Stylochus tauricus	12	1.39373	33.33	0.46453	**8**
Middendorfia caprearum	5	0.58072	66.66	0.38711	**9**
Perinereis cultrifera	2	0.23229	66.66	0.15484	**10**
Xantho poressa	2	0.23229	33.33	0.07742	**11**
Syllis gracilis	1	0.11614	33.33	0.03871	**12**

Table 4 - Quantitative structure of the macro benthos on the southern side of „Little Gulf" Damn (sampling area 3)

Species	A	D%	C%	W	Rank
Mytilaster lineatus	515	59.7448	100	59.7448	**1**
Sphaeroma pulchellum	66	7.65661	100	7.65661	**2**
Hyale pontica	55	6.38051	100	6.38051	**3**
Idotea baltica	48	5.56845	100	5.56845	**4**
Stylochus tauricus	41	4.75638	100	4.75638	**5**
Mytilus galloprovincialis	39	4.52436	100	4.52436	**6**
Balanus improvisus	35	4.06033	100	4.06033	**7**
Actinia equina	36	4.17633	66.66	2.78394	**8**
Rissoa splendida	11	1.2761	100	1.2761	**9**
Bittium reticulatum	11	1.2761	33.33	0.42533	**10**
Middendorfia caprearum	5	0.58005	33.33	0.19333	**11**

Table 5 - Quantitative structure of the macro benthos
between 2 Mai and Vama Veche (sampling area 4)

Species	A	D%	C%	W	Rank
Mytilaster lineatus	414	57.9021	100	57.9021	**1**
Mytilus galloprovincialis	65	9.09091	100	9.09091	**2**
Idotea baltica	63	8.81119	100	8.81119	**3**
Sphaeroma pulchellum	60	8.39161	100	8.39161	**4**
Actinia equina	38	5.31469	100	5.31469	**5**
Balanus improvisus	33	4.61539	100	4.61539	**6**
Rissoa splendida	6	0.83916	100	0.83916	**7**
Hyale pontica	16	2.23776	33.33	0.74585	**8**
Stylochus tauricus	10	1.3986	33.33	0.46615	**9**
Xantho poressa	5	0.6993	66.66	0.46615	**9**
Bittium reticulatum	4	0.55944	33.33	0.18646	**10**
Syllis gracilis	1	0.13986	33.33	0.04662	**11**

Table 6 - Quantitative structure of the macro benthos
at Vama Veche (sampling area 5)

Species	A	D%	C%	W	Rank
Mytilaster lineatus	508	56.0706	100	56.0706	**1**
Mytilus galloprovincialis	171	18.8742	100	18.8742	**2**
Sphaeroma pulchellum	54	5.96027	100	5.96027	**3**
Hyale pontica	49	5.40839	100	5.40839	**4**
Balanus improvisus	48	5.29801	100	5.29801	**5**
Idotea baltica	39	4.30464	100	4.30464	**6**
Actinia equina	21	2.31788	66.66	1.5451	**7**
Rissoa splendida	12	1.3245	66.66	0.88291	**8**
Perinereis cultrifera	2	0.22075	66.66	0.14715	**9**
Syllis gracilis	1	0.11038	33.33	0.03679	**10**
Bittium reticulatum	1	0.11038	33.33	0.03679	**10**

Our study made during 2004 – 2005 on the macro zoo benthic communities in the rocky mid-littoral at Constanta revealed very high values of W for the leading species of the biocenosis (*Mytilaster lineatus*, W = 85.30 for the samples collected during the warm season and W = 85.52 for the ones

in the cold season) compared to the Marine Reserve. The values of the ecological significance index of the other important species in the wave-crashing area biocenosis were much reduced in Constanta area compared to the southern littoral (Table 7).

Table 7 - The ecological significance index for the main species of the rocky mid-littoral in the Marine Reserve and at Constanta

Species	**Marine Reserve**	**Constanta (Niţă, 2008)**
Mytilaster lineatus	$W_{average} = 57.07$	$W_{average} = 83.91$
Mytilus galloprovincialis	$W_{average} = 12.53$	$W_{average} = 2.41$
Idotea baltica	$W_{average} = 6.19$	$W_{average} = 4.36$
Balanus improvisus	$W_{average} = 4.35$	$W_{average} = 1.11$
Sphaeroma pulchellum	$W_{average} = 6.7$	$W_{average} = 2.0$
Hyale pontica	$W_{average} = 4.4$	$W_{average} = 0.48$

On the basis of the effected calculus (according to the most common method – the one proposed by Jaccard) (GOMOIU, SKOLKA, 2001), it was possible to appreciate the affinities between the identified species. This meant practically to calculate the cenotic affinity index, as shown in Figure 5.

Species	*Ac*	*Sty*	*Per*	*Syl*	*Mid*	*Bit*	*Ris*	*Myt*	*My*	*Bal*	*Hy*	*Id*	*Sph*	*Xan*
Actinia equina		43	38	23	46	36	40	87	87	87	73	87	87	30
Stylochus tauric.			20	11	44	44	36	46	46	46	42	46	46	22
Perinereis cultr.				33	37	22	8	33	33	33	33	33	33	28
Syllis gracilis					12	12	22	20	20	20	12	20	20	0
Middendorfia c.						20	8	40	40	40	40	40	40	25
Bittium reticul.							27	40	40	40	33	40	40	11
Rissoa splendida								53	53	53	35	53	53	20
Mytilaster lin.									100	100	86	100	100	27
Mytilus gallopr.										100	86	100	100	27
Balanus improv.											86	100	100	27
Hyale pontica												86	86	21
Idotea baltica													100	27
Sphaeroma pul.														27
Xantho poressa														

Fig. 5 - The diagram of the cenotic affinity index in "2 Mai - Vama Veche" Marine Reserve's mid-littoral

As we said before, the five sampling stations are placed in the mid-littoral of the Marine Reserve 2 Mai – Vama Veche, on a coastal length of about 7 km. The distance is relatively small, though, the living conditions of the organisms are influenced by local factors that act in the five sampling sites; the presence and position of the damns, of the rocky peaks and platforms or of the gulfs burrowed in the sarmatic rock, all of these put their prints on the hydrodynamics, sediments, turbidity, water renewal, dead organisms retention, etc.

Sample	S1	S2	S3	S4	S5
S1		**0.916**	**0.869**	**0.833**	**0.782**
S2			**0.782**	**0.833**	**0.782**
S3				**0.869**	**0.818**
S4					**0.869**
S5					

Fig. 6 - The diagram of the ecological similarity index in 2 Mai - Vama Veche Marine Reserve's mid-littoral

CONCLUSIONS

The Marine Reserve 2 Mai – Vama Veche has a high specific and ecologic biodiversity, mainly because of the great variety of the substrate, the big distance from Danube outfalls (smaller salinity variations) and lack of important anthropogenic impact;

The class structure of the identified animals reveals the obvious dominance of the bivalves (69.7% – 3001 individuals), followed by the crustaceans (22.2% – 954 individuals), anthozoans (4% – 171 individuals) and turbelariates (2% – 86 individuals);

The phylum structure is as following: Mollusca – 71.7% (3086 individuals), Arthropoda – 22.2% (954 individuals), Coelenterata – 4% (171 individuals), Plathelmintes – 2% (86 individuals) and Annelida – 0.2% (9 individuals);

By studying the diagrams resulted after calculating the cenotic affinity index, we can conclude that the species with a high cenotic affinity are the ones that are characteristic for the considered biocenosis, and these are: *Mytilaster lineatus, Mytilus galloprovincialis, Balanus improvisus, Actinia equina, Idotea baltica, Sphaeroma pulchellum* and *Hyale pontica*, so these species represent the functional nucleus of the rocky mid-littoral biocenosis in the area of 2 Mai – Vama Veche.

The calculus of the ecological similarity index revealed a relative homogeneity of the five sampling stations placed among 7 km of coast between 2 Mai and Vama Veche. The two stations in 2 Mai had the maximum homogeneity (S_S = 0.916), while the biggest differences appeared between station no. 5 (in Vama Veche) and stations no. 1 and 2 (situated on the Southern side of Mangalia Harbor and at the "Little Gulf").

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