



MACROZOOBENTHOS OF THE ROCKY COASTS OF VLORA, ALBANIA

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SYNOPSIS

Macrozoobenthos of shallow rocky coast of Vlora area (south-west Albania) has been studied, focusing on the supralittoral, mediolittoral and upper part of infralittoral during 2004 – 2006. This study gives data on species composition of macrozoobenthos, general assessment of quantitative characteristics, seasonal variations and stability of zoobenthic populations, as well as abiotic parameters of the sea water in the sampling sites. A total of 140 species has been reported, with a high dominance of mollusks, besides other species of cnidarians, nematodes, sipunculids, annelids, crustaceans, bryozoans and echinoderms. Macrozoobenthos of shallow rocky coasts of Vlora resulted with a relatively high species richness and a low abundance. The stability of zoobenthic community in general should be considered as low. The composition of populations and the ecological situation of the zoobenthos in Vlora coast are related to the exposal of the coast, substrate type, vegetation cover, physical-chemical characteristics of the water and the level of human impact along the coast.

INTRODUCTION

There is a lack of studies on macrozoobenthos of the hard bottoms in Albania. Most of the existing data are based on sporadic collections from fishing. Existing publications are mostly species list of mollusks (DHORA 1978, DHORA & GJIKNURI 1995, DHORA & SALVINI – PLAWEN 1997, DHORA & KASHTA 2001). The most recent study has been done on macrozoobenthos of the rocky coast of Shengjini, in North-West Albania, including ecological and taxonomic assessment (BEQIRAJ & SELIMI 2008). There are also few data as scientific reports and brochures (BEQIRAJ 2002).

The present work is among the first specific studies on macrozoobenthos of a defined rocky coastal area in Albania. Evaluations of macro benthic populations in taxonomic and quantitative aspects are made in each sampling station.

Comparative data between groups and stations are given, accompanied by some physical – chemical parameters of the sea water. Based on the variations of species composition and quantitative characteristics, a general assessment of the stability of macro benthic populations has been made.

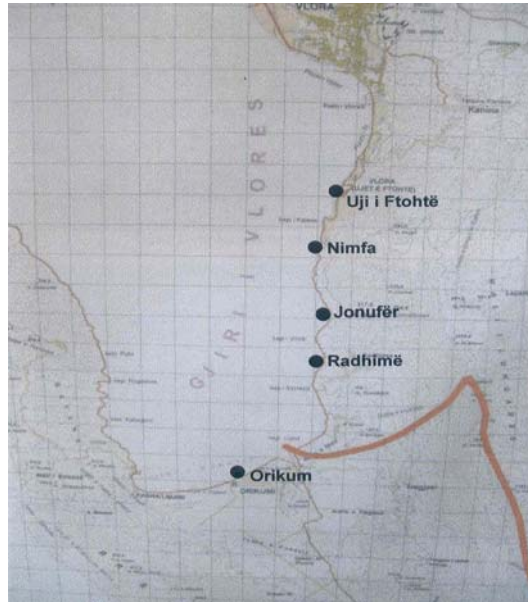


Figure 1. Map of Vlorë coast with the sampling stations.

METHODS

Sampling has been made in August – September and March – May, 2004 - 2006. Five sampling sites have been selected in 20 km rocky coast of Vlorë (figure 1), which represents the eastern coast of Vlorë Bay. For each sampling site, 5 transects in 50 m of linear distance between them have been made, including supralittoral, mediolittoral and upper part of infralittoral. Each sample has been taken within a standard frame of 50 cm x 50 cm. 10 samples for each transect have been taken.

When possible, species identification and quantitative assessments have been done directly in the field. In other cases, samples have been conserved in formalin 4% and transported to the laboratory for species identification and quantitative assessments. Species identification has been done up to the lowest possible taxa. In few cases the identification has remained in genera or family level.

Some simple quantitative assessments have been made. It has been computed: density (d) of each species in each sample; average density of each species in each station; coverage in percentage for the colonial forms; constancy (K) of each species in each station; constancy of all species in all stations. Based on the values of constancy the species have been classified as: constant ($K > 50\%$); associated ($25\% < K < 50\%$); occasional ($K < 25\%$) (after PEJA 1995).

In each sampling period and several times during the study, some physical – chemical parameters have been measured: salinity (as chlorines – Cl), dissolved oxygen (O₂), pH, temperature (T), conductivity, water density.

RESULTS AND DISCUSSION

In the macrozoobenthic samples of the rocky coast of Vlora, a total of 140 species has been found (see Annex). They belong to Mollusca: 78 species; Crustacea: 25 species; Annelida: 19 species; Echinodermata: 8 species; Cnidaria: 4 species; Nematoda: 3 species; Bryozoa: 2 species; Sipunculida: 1 species.

There is a high dominance of mollusks in the aspect of species number, which is 55% of the all reported species, with 59 gastropods, 18 bivalves and 1 polyplacophoran. Crustaceans and annelids are presented with a considerable species number. Crustaceans are 18% of the total species number, with the dominance of decapods, represented with 16 species. Annelids are 13% of the total species number, of which 17 species are polychaetes.

The total species number (140) should be considered as relatively high, taking into account that samples have been taken in a shallow marine area; anyway, the expected number of species should be higher, considering the species cited in the publications related to macrozoobenthos of the Adriatic Sea (after LUTHER & FIELDER 1988; MOJETA & GHISOTI 2000; RIEDL 1991). Another reason for the relatively low species number may be related to high human impact at the coast of Vlora, as it has been stated from many reports about environmental situation in Albania (such as TROENDLE 2002). The impact in relevant area is mostly due to the very intensive and uncontrolled development touristic infrastructure, as well as increase of sewage and wastes of urban origins. This impact may effect directly the marine ecosystem in general, with obvious consequences on benthic community.

Based on the species presence and values of constancy (see Annex), 23% of the species are considered as constant ($K > 50\%$), 17% of the species are considered as associating ($25\% < K < 50\%$) and 60% of species as occasional ($K < 25\%$).

Taxa with the highest value of density/coverage and constancy, among mollusks were *Littorina neritoides*, *Monodonta turbinata*, *Gibbula*, *Patella caerulea* and *Mytilus galloprovincialis*; among crustaceans: *Chthamalus depressus*, *Pachygrapsus marmoratus*, *Porcellana platycheles*, *Xantho* and Paguridae species; among annelids: Nereidae, Syllidae, Eunicidae and Serpulidae; among cnidarians: *Actinia equina*, *Anemonia sulcata* and *Balaniophyllia europaea*; among echinoderms: *Arbacia lixula*, *Paracentrotus lividus* and *Ophiotrix fragilis*; and among nematodes: Enoploidea species (see Annex).

Most of the species with high values of density and cover had also high values of constancy (see Annex), although in some cases species with low density but with high constancy have been encountered, such as *Gibbula* and *Rissoa* at the site Uji i Ftohte, or *Bittium reticulatum*, *Chiton olivaceus*, *Rissoa lia*, *Pisidia longicornis* and *Arbacia lixula* at the site Nimfa.

As it is seen in the table 1 and figure 2, the species varies from 80 in Jonufer to 39 in Orikum. In all sites there is a high dominance of mollusks in species number, from 57% to 66% in the four stations (Uji i Ftohte 58%; Nimfa 57%; Jonufer 59%; Radhime 66%) and 48% in the last site, Orikumi. The difference of species number in Orikumi, compared to the other sites, is mostly dedicated to the low number of mollusk species and relatively to crustaceans. One of the reasons of the high difference in species number in Orikumi, may be related to the fact that the rocks in this site are artificial, consisting in concrete blocks, while in all other sites the coast consists in natural calcareous rocks.

Table 1. Species number for each group in each station.

Station Group	Uji i Ftohte	Nimfa	Jonufër	Radhimë	Orikum
Mollusca	31	41	47	43	19
Crustacea	9	13	16	13	9
Annelida	7	9	8	3	7
Nematoda	2	2	1	1	1
Cnidaria	2	2	1	2	2
Echinodermata	1	5	6	2	
Sipunculida	1		1		
Bryozoa				1	1
Total	53	72	80	65	39

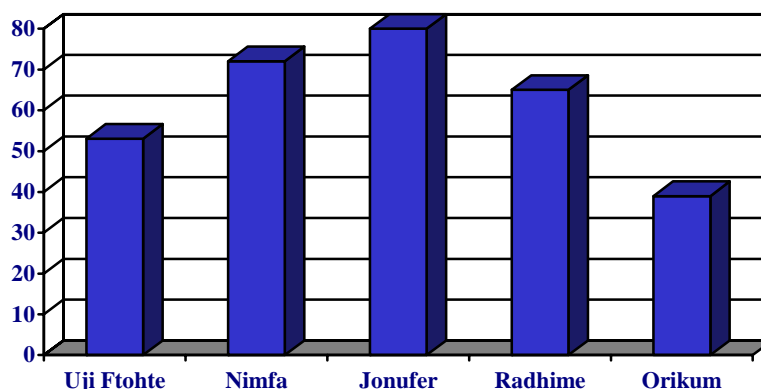


Figure 2. Species number for each station

From the Table 1, Figure 2 and the Annex, some comparison of the composition of biocenosis between stations could be done. These comparisons are also complemented with the data of physical-chemical analysis of the sea water in the sampling sites, as following:

Uji i Ftohtë: 13 taxa have been found only in this station. In this station has been recorded the highest presence of nematodes (3,7%) and the lowest presence of crustaceans (16,9%) and echinoderms (1,8%) compared to the other stations. Algal

coverage was 20% in spring season and 36% in autumn. From the water analysis, in this station it has been recorded the highest value of: O₂ (8,12 mg/l – September), T (17⁰C – March), Conductivity (312µs/cm – May), and the lowest value of: Cl (2127 mg/ml – March), O₂ (6,84 mg/l – May), T (19,7 ⁰C – May), water density (1,018 – May).

Nimfa: 14 taxa have been found only in this station. Algal coverage was 59% in spring and 30% in autumn. As regards to the water analysis, in this station it has been recorded the highest value of: Cl (2410,6 mg/ml – September), T (17⁰C – March), Cl (2458mg/ml – May); the lowest value of Cl (2127 mg/ml – March) and Conductivity (285µs/cm – May).

Jonufër: 18 taxa have been found only in this station. In this station has been recorded the highest presence of echinoderms (7,5%) and the lowest presence of cnidarians (1,2%), compared to the other stations. Algal coverage was 23% in spring and 15% in autumn. From the water analysis, in this station it has been recorded the highest value of: pH (8,28 September), Cl (2335 mg/ml – March), Conductivity (296µs/cm – March) and the lowest value of T (14,9 ⁰C – March).

Radhimë: 12 taxa have been found only in this station. In this station has been recorded the highest presence of mollusks (66,1%) and the lowest presence of annelids (4,6%) and bryozoans (1,5%). Algal coverage was 21% in spring and 17% in autumn. From the water analysis, in this station it has been recorded the highest value of O₂ (7,75 mg/l – March), pH (8,52 – March; 8,32 - May), water density (1,026 – March; 1,024 - May) and the lowest value of Cl (2230 mg/ml – May).

Orikum: 9 taxa have been found only in this station. In this station has been recorded the highest presence of crustaceans (23%), annelids (17,9%), cnidarians (5,1%), bryozoans (2,5%) and the lowest presence of mollusks (48,7%). Algal coverage was 10% in spring and 7% autumn. As regards to water analysis, in Orikumi it has been recorded the highest value of O₂ (8,72 mg/l – May), T (20,2⁰C – May; 22,5 ⁰C – September), water density (1,044 – March) and the lowest value of: O₂ (6,58 mg/l – March), water density (1,018 – March, similar to the site Uji i Ftohtë), conductivity (234µs/cm – March).

Seasonal variations and stability of zoobenthos have been analysed based on the differences in species number, density/cover and constancy between seasons and stations. 118 species have been recorded in August - September, whereas 87 species in March - May. By comparing sampling seasons for the same station, differences in species number were not very high. The highest seasonal variations resulted for the populations of mollusks and crustaceans. By comparing the sampling sites, the highest variations have been recorded in Jonufër. The fact that 60% of species are occasional (K<25%) and 23% of the species are constant (K>50%) shows a relatively low stability of the macrozoobenthic community. The highest stability has resulted in the stations of Nimfa and Orikum.

CONCLUSIONS

Macrozoobenthos of shallow rocky coasts of Vlora has relatively high species richness and a low density. Gastropod and bivalve mollusks are the dominant group in the aspect of species number and density. The stability of macrozoobenthic community in general is considered as low. Populations of mollusks and crustaceans had the highest seasonal variations in species number and density. The composition of populations and the ecological situation of the macrozoobenthos in Vlora coast are related to the exposure of the coast, substrate type, vegetation cover, physical-chemical characteristics of the water and the level of human impact along the coast.

The explanation of the situation of coastal benthic community in Vlora needs complex and integrated studies in the fields of biology, geology, hydrology, hydro-chemistry, environment impact etc.

Macrozoobenthos of rocky coasts of Vlora represents interest for further and continuous studies, aiming to increase knowledge and protection of biodiversity and natural values, as well as potentials for the sustainable development of local community.

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ANNEX

Species list with average density for each sampling site and average constancy K (%) of each species. Spr. = Spring season; Aut. = Autumn season.

Cnidaria (ANTH. = Anthozoa)

Group	Species	Uji i ftohtë		Nimfa		Jonufër		Radhimë		Orikum		K (%)
		Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	
ANTH.	<i>Actinia equina</i>		0.24					0.62		0.1	0.15	40
ANTH.	<i>Anemonia sulcata</i>	1.76		3.6	0.9			1.04	0.33	1.3	0.4	70
ANTH.	<i>Balanophyllia europaea</i>			1								10
ANTH.	<i>Balanophyllia sp.</i>					0.64	0.12					20

Mollusca (GAST. = Gastropoda; BIV. = Bivalvia; POLYP. = Polyplacophora)

Group	Species	Uji i Ftohtë		Nimfa		Jonufër		Radhimë		Orikum		K (%)
		Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	
GAST.	<i>Alvania lineata</i>			0.04		0.04	0.04	0.04				40
GAST.	<i>Alvania beani</i>							0.04				10
GAST.	<i>Alvania sp.</i>							0.04				10
GAST.	<i>Alvania cimex</i>			0.12				0.04				20
BIV.	<i>Anadara corbuloides</i>					0.04	0.16					20
BIV.	<i>Anomia ephipium</i>			0.08		0.08			0.08		0.05	40
BIV.	<i>Arca noae</i>				0.1	0.16	0.04					30
BIV.	<i>Arca tetragona</i>						0.04				0.05	20
BIV.	<i>Barbatia barbata</i>			0.24		0.08						20
GAST.	<i>Bittium reticulatum</i>			0.84	0.05	0.32	0.24	0.04	0.08			60
GAST.	<i>Bittium sp.</i>							0.04				10
BIV.	<i>Brachidontes pharaonis</i>	0.04	0.08						0.2			30
GAST.	<i>Buccinum corneum</i>						0.04					10
BIV.	<i>Cardita sulcata</i>					0.08			0.04			20
GAST.	<i>Cantharus d'orbigny</i>					0.04	0.04					20
BIV.	<i>Chama gryphoides</i>			0.04				0.16				20
POLYP.	<i>Chiton olivaceus</i>	0.2	0.6	0.4	0.1	0.4	0.48	0.29	0.04			80
GAST.	<i>Cerithium vulgatum</i>			0.08		0.56	0.28	0.12				40
GAST.	<i>Cerithidium submamillatum</i>							0.37				10
GAST.	<i>Clanculus jussieui</i>			0.04			0.04					20
GAST.	<i>Clanculus cruciatus</i>			0.04		0.04						20
GAST.	<i>Columbella rustica</i>	3.7	0.08	2.4	1.1	0.36	2.4	0.37	0.54	0.05	0.1	100
GAST.	<i>Conus mediterraneus</i>						0.2					10
GAST.	<i>Colubraria reticulata</i>						0.04					10
GAST.	<i>Engina leucozona</i>						0.08					10
GAST.	<i>Fasciolaria lignaria</i>					0.04	0.04					20

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GAST.	Solarium pseudoperspectivum						0.04					10
GAST.	Spiroglyphus glomeratus			0.04								10
BIV.	Tapes decussatus					0.04						10
GAST.	Thais haemastoma									0.1		10
GAST.	Turritella triplicata							0.08				10
GAST.	Vermetus sp.	0.8		0.8	2.2	2	4.08			2.25	4.25	70
BIV.	Venus verrucosa					0.04						10

Annelida (POL = Polychaeta; ARCH. = Archannelida; OLIG. = Oligochaeta)

Group	Species	Uji i ftohtë		Nimfa		Jonufër		Radhimë		Orikum		K(%)
		Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	
POL.	Capitellidae			0.08		0.04						20
POL.	Eulalia viridis			0.04								10
POL.	Eunicidae					0.12	0.04					20
POL.	Hesione pantherina									0.1		10
POL.	Nereis diversicolor					0.04						10
POL.	Hyalinoecia fauveli		0.04						0.04			20
POL.	Lagisca extenuata		0.16		0.05		0.04					30
POL.	Nereidae		0.64	0.6	0.2	0.36	0.12			0.05	0.25	70
OLIG.	Oligochaeta (unidentified)									0.1		10
POL.	Perineris cultifera			0.04								10
POL.	Phyllodocidae						0.12					10
POL.	Pilargis verrucosa		0.04									10
POL.	Pilargiidae		0.04									10
POL.	Platynereis dumerilli			0.2								10
POL.	Polycirrus aurantiacus									0.05		10
ARCH.	Polygordius sp.									0.05		10
POL.	Polychaeta (unidentified)			0.3	0.1							20
POL.	Serpulidae	2.32		5.8	6.2	14.8	7.2	12.7	0.83	14.6	8.5	90
POL.	Syllidae	0.08	1.44	0.2		0.24		0.04	0.2	0.1	0.3	80

Crustacea (DEC. = Decapoda; CIRR. = Cirripedia; EUPH. = Euphasiacea; AMPH. = Amphipoda; ISOP. = Isopoda; ANIS. = Anisopoda.)

Group	Species	Uji i ftohtë		Nimfa		Jonufër		Radhimë		Orikum		K (%)
		Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	
DEC.	Acanthonyx lunulatus	0.08										10
ANIS.	Anisopoda									0.05		10
CIRR.	Chthamalus depressus					5.6				0.6	10	2
CIRR.	Chthamalus stellatus				0.25							10
ISOP.	Dynamene edwardsi	0.04										10
DEC.	Eriphia verrucosa			0.04	0.05	0.04	0.12					40
EUPH.	Euphasiacea									0.05		10
DEC.	Eurynome aspera							0.04				10
AMPH.	Gammaridae	3.24	2.36	2.2	0.05	0.64	0.36	0.12	0.85	0.45	1	50
ISOP.	Isopoda					0.32				0.05		100
DEC.	Maja squinado							0.04				20
DEC.	Maja verrucosa						0.04					10

DEC.	Munida sp.							0.04				10
DEC.	Pachygrapsus marmoratus		0.28	0.08	0.05		0.04	0.08		0.15	0.1	10
DEC.	Paguridae	0.16	0.16	0.2		0.36	4.2		0.16			70
DEC.	Palaemon elegans			0.04								60
DEC.	Pilumnus hirtellus			0.08							0.05	10
DEC.	Pisa armata							0.08		0.05		20
DEC.	Pisa tetraodon					0.04						20
DEC.	Pisidia longicornis		0.4	0.4	0.3	0.32	2.08		0.25			10
DEC.	Porcellana platycheles		0.08	0.9	0.9	0.16	1.92	0.5	0.2			60
DEC.	Sphaeroma serratum			0.2	0.2		0.04		0.5	0.05		70
DEC.	Xantho poressa				0.05		0.08					50
DEC.	Xantho incisus	0.04	0.12				0.16		0.04			20

Echinodermata (OPH. = Ophiuroidea; ASTER. = Asteroidea; ECHIN. = Echinoidea; HOL. = Holothuroidea).

Group	Species	Uji i ftohtë		Nimfa		Jonufër		Radhimë		Orikum		K (%)
		Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	
OPH.	Amphiura filiformis			0.04								10
ECHIN.	Arbacia lixula	2.36		0.8	0.5	2.24	0.12	0.3				60
ASTER.	Coscinasterias tenuispina			0.04								10
HOL.	Holothuria tubulosa						0.08					10
OPH.	Ophiopsila aranea				0.05		0.04					20
OPH.	Ophiothrix fragilis			0.04			0.04					20
OPH.	Ophiothrix quinquemaculata					0.04	0.04					20
ECHIN.	Paracentrotus lividus						0.08		0.08			20

Others: NEM. = Nematoda; BRY. = Bryozoa; SIP. = Sipunculida

Group	Species	Uji i ftohtë		Nimfa		Jonufër		Radhimë		Orikum		K (%)
		Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	Spr.	Aut.	
NEM.	Chromadoroidea	0.08										10
NEM.	Enoploidea	0.04	1.24	0.2		0.28	0.04			0.4	0.05	70
NEM.	Nematoda (unidentified)			0.04	0.05			0.12				30
BRY.	Micropora coriacea							0.12				10
SIP.	Phycosoma granulatum		0.12			0.04	0.04					10

