

## DATA ON MACRO ZOOBENTHOS IN ROCKY AREAS OF THE ADRIATIC SEA OF ALBANIA

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### ABSTRACT

The present study aims to assess and analyze the species composition, abundance and environmental state of the macro zoobenthic community of the rocky areas along the Adriatic coast of Albania. Benthic samples have been taken during July – August 2011 in four rocky coastal areas, where 140 taxa of macro zoobenthos have been recorded in total. The groups with the highest presence and abundance were mollusks of the families Patellidae, Trochidae, Cerithiidae, Muricidae, Risoiidae and Vermetidae, crustaceans of the families Balanidae, Gamaridae, Grapsidae and Mayidae, as well as the polychaetes Serpulidae. Five species have been reported for the first time for Albania: the gastropods *Trimusculus mammillaris* and *Vexillum savignyi*, the bivalves *Acesta excavata* and *Musculista senhousia*, and the sponge *Hexadella racovitzai*. Two alien mollusk species for the Mediterranean have been recorded: *Rapana venosa* and *Musculista senhousia*. From a preliminary assessment, the benthic community in the studied area seems to have a relatively low stability and unfavorable environmental state. The species composition and abundance of benthic macro invertebrates in this area are under the influence of the exposure of the coast, algal cover and environmental impact.

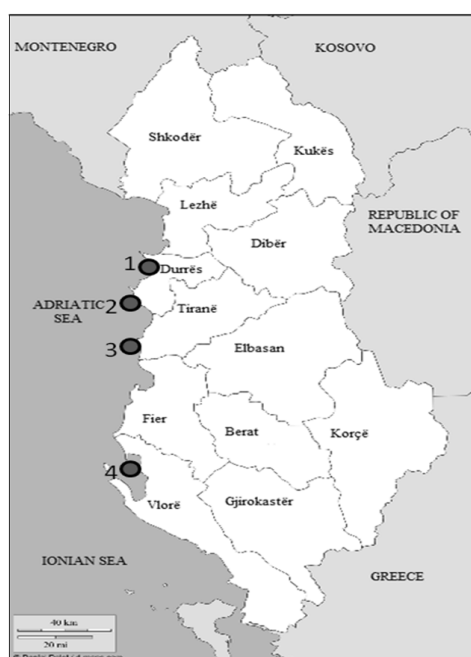
**KEYWORDS:** Macro Zoobenthos, Rocky Coasts, Albania, Adriatic Sea

### INTRODUCTION

Rocky areas in the Albanian part of Adriatic Sea signify very interesting habitats. They represent short, fragmented and isolated segments among the sandy coast that prevail in most of the Albanian Adriatic coastline and are continuously under the impact of erosion. For these reasons and especially due to the small surface and habitat's fragmentation, their benthic communities are characterized by a high ecological sensitivity (Beqiraj et al., 2011). The present study has been carried out in shallow rocky coasts of four areas in the Albanian Adriatic coast. This is the first study focused on macro zoobenthos of these areas that aims to assess and analyze the species composition, abundance and environmental state of macro zoobenthic populations. Macro zoobenthos of the rocky areas of Albanian Adriatic coast is very poorly studied, with the exception of some recent studies on macro zoobenthos of Vlora Bay. In the other part of rocky areas of Adriatic Sea of Albania, data on macro zoobenthos are poor, sporadic and most of these data are not published, but exist as reports only. During the last two decades, environmental impacts in most of these areas have increased because of uncontrolled urban and tourism development. This impact is also reflected on benthic communities of shallow rocky coasts in Albania (Fraschetti et al. 2011). For these reasons, this area is sensitive in the ecological and environmental point of view, but also with high interest on studies and local economy related to the development of coastal tourism.

## MATERIALS AND METHODS

Samples have been taken during July-August 2011 in four rocky areas: Shën Pjetër, Kallm, Spille and Triport (Figure 1), in very shallow water, including the supralittoral, mediolittoral and upper limit of infralittoral. The samples were taken through standard methods for benthic sampling in hard bottoms, within a frame 50 x 50 cm for the quantitative assessment, after the methods of Schlieper (1976), Cattaneo et al. (1978), Drago et al. (1980), Zenetos et al. 2000. In each site the sampling was done along three transects, with 50 m distance from each other. In each transect 6 frame samples have been taken, of which 3 in supralittoral and 3 in medio and upper infralittoral. In this way, 18 samples have been taken in each site and 72 samples in total for the all sites. After being collected, the samples were conserved in alcohol (ethanol) 75% and transported in the laboratory.



**Figure 1: Map of Albania with the Sampling Sites: 1. Shën Pjetër; 2. Kallm; 3. Spille; 4. Triport**

Identification of species and taxonomic nomenclature has been based on Cossignani (1992), Clemam Checklist of European Marine Molluscs, D'Angello & Gargiullo (1991), Fauchald (1977), Gianuzzi-Savelli et al. (1994, 1997, 1999, 2001, 2003), Millard (2001), Mojetta & Ghissoti (1994), Pope & Goto (1991, 1993), Riedl (1991), Trainito 2004.

It was evaluated the species composition in each site, abundance of each species in each sample, the average abundance of all species in each site. Frequency for the patellids and trochids, as the most commune and abundant groups,

has also been evaluated. The frequency has been calculated after the formula,  $F = \frac{n}{N} \times 100$  (Peja 1995).

The species presence has been evaluated using the constant C ( $C = a / p * 100$ ) and the species classification in constant species, accompanying species and occasional species has been done, referring to Blanc et al. (1976) and Peja (1995). Based on this classification it has been evaluated the stability of benthic community.

The similarity coefficient Sokal & Sneath ( $i = s / s + 2 (u+v)$ ), after Blanc et al. (1976) has been used for assessing the similarity of species between sites. Shanon & Weaver index ( $H' = - (P_i * \ln P_i)$ ) has also been evaluated.

## RESULTS AND DISCUSSIONS

140 taxon have been found in the studied area, from which gastropods had the highest number of species. This number can be considered as a relatively high number, taking into account that the sampling has been done in very shallow water, during one season only, and that these sites represent very small areas, as short segments of rocky coasts, fragmented and isolated among the sandy coast. Species number for each large taxa is as in the following:

**Table 1**

Porifera	1
Cnidaria	6
Nematoda	1
Polyplacophora	2
Gastropoda	72
Bivalvia	21
Polychaeta	3
Crustacea	26
Echinodermata	6
Bryozoa	1
Tunicata	1

The groups with the highest presence and abundance were mollusks of the families Patellidae, Trochidae, Cerithiidae, Muricidae, Risoiidae and Vermetidae, crustaceans of the families Balanidae, Gamaridae, Grapsidae and Mayidae, as well as the polychaetes Serpulidae. 5 species have been recorded for the first time in Albania: the sponges *Hexadella racovitzae* Topsent 1816, the gastropods *Trimusculus mammillaris* (Linnaeus 1758) and *Vexillum savignyi* (Payraudeau, 1826) and the bivalves *Acesta excavata* (Fabricius, 1779) and *Musculista senhousia* (Benson in Cantor, 1842). Records of the new species for the Albanian coast show the relative importance of the studied areas for the biodiversity in national range.

As shown in the Annex 1, *Hexadella racovitzae* is recorded in Triport, *Vexillum savignyi*, *Musculista senhousia* and *Acesta excavata* are recorded in Kallm, while *Trimusculus mammillaris* is recorded in Spille.

It is also worthy to note the presence of two alien species for the Mediterranean: the gastropod *Rapana venosa* (Valenciennes, 1846) and the bivalve *Musculista (Arcuatula) senhousia* (Benson in Cantor, 1842), recorded respectively in Spille and Kallm. With this records, the number of marine alien species reported for Albania reaches 22, referring to a recent publication (Beqiraj et al., 2012) that has reported 21 marine alien species for Albania, including macroalgae, macroin vertebrates and fish species.

The presence of alien species shows the regional importance of the Albanian coast as a corridor for the distribution of alien species from the Ionian Sea northward to the Adriatic Sea, as it has also been highlighted in Beqiraj et al. (2012) and Katsanevakis et al. (2011).

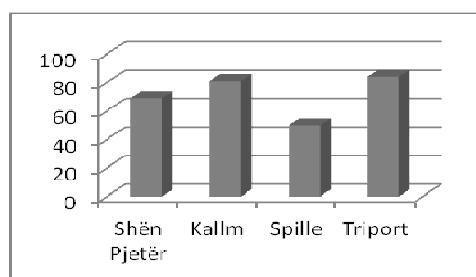
As it is shown in the Figure 2, the highest species number of benthic macro zoobenthos was found in Kallm and Triport, respectively 81 and 84 species, while the lowest species number was found in Spille (50 species).

The highest species number of benthic macroin vertebrates in Kallm and Triport may be related to the underwater topography that is characterized by a high heterogeneity, thus, creating a diversity of microhabitats. Species with a large ecological spectrum were found in the study areas, like photophilic species, schiaphilic species, species associated to

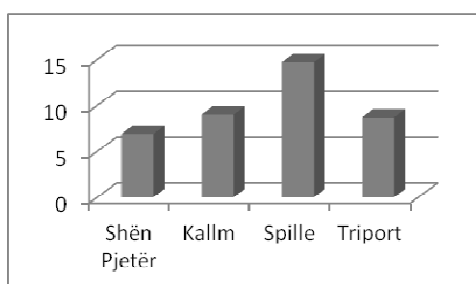
coastal macro vegetation, species associated to bare habitats (without macro vegetation), species of exposed aereas, species of quiet waters etc., based on the ecological characteristics of the recorded species (after Mojetta & Ghissoti 1994, Riedl 1991, Trainito 2004).

The lower presence of benthic macro invertebrates in Spille may be related to the exposure of the coast. The strong wave activity in this area decreases species stability. Most of the species that prefers quiet waters cannot establish their population there. Another factor may be the high sedimentation rate at the coast and consequently the cover of the mediolittoral with silt, as it has been recorded during the sampling in the two last years. A possible contribution to this situation may be related to a recent construction of a long concrete mooring platform that has apparently changed the wave and sedimentation regime at the coast. Another factor maybe the macroalgal cover that is smaller compared to the other sites, therefore, several macro invertebrate species that are known to shelter in coastal macroalgae (referring to Riedle, 1991) were missing in this site.

As shown in the figure 2 and 3, sites with the highest species diversity have a lower abundance and vice-versa. This may be considered as an expected situation, based on the populations' ecology principles, where in a habitat with a high species number the inter specific competition is higher, which is later followed by a decrease in population abundance after Peja 1995).



**Figure 2: Species Number of Benthic Macro Invertebrates in Each Sampling Site**



**Figure 3: Average Abundance of Benthic Macro Invertebrates in Each Sampling Site**

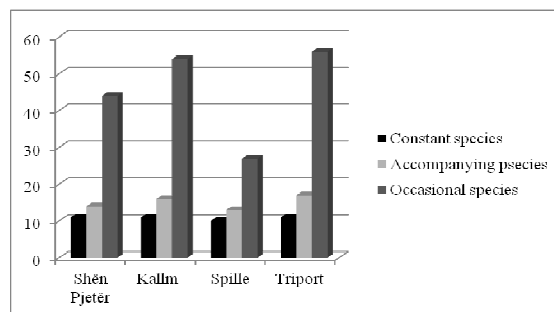
Patellidae and Trochidae families had the highest abundance in all sites. The total abundance and relative frequency of patellids and trochids for each area is given in Table 2.

**Table 2: Total Abundance and Frequency of Patellids and Trochids in Each Sampling Site**

Sampling Site	Patellidae		Trochidae	
	Total Abundance	Frequency(%)	Total Abundance	Frequency(%)
Triport	182	24.7	140	19.07
Spille	148	20.1	183	24.8
Kallm	86	11.7	134	18.3
Shën Pjetër	102	21.4	125	26.2

Based on the frequency values shown in Table 2, patellids and trochids represent half of the total number of all individuals found in Triport, Spille and Shën Pjetër and about 30% of species found in Kallm. The highest abundance of patellid and trochid families may be related to the dense macroalgal cover in most of the studied sites, as most of the recorded species from these families are known to shelter in habitats with macroalgal cover (after Mojetta & Ghissoti 1994, Riedl 1991, Trainito 2004). The relatively small number of filter feeder organisms, mainly bivalves and very few from the other groups, could be an indicator of a degraded water quality and an unfavourable ecological state in the studied areas, as the filter feeders in general are more sensitive to the water quality (after Boero, 1994).

As shown in the figure 4, there is a small presence of constant species that indicates a low stability of benthic populations, that could be related to the highest environmental impact in this area. Studied areas are located in or near areas with significant impact from tourism and urban development (Lalzi Bay, Durrës, Vlora), like along the most of Adriatic coast in Albania.



**Figure 4: Classification of Species According to the Constant Values for Each Site**

As shown in the table 3, there is a low value of the similarity coefficient Sokal & Sneath (i) between the sampling sites. It has a small variation from 23.37% (the lowest value) to 26.76% (the highest value). This small variation may be related to the fact that the whole studied area is a short segment in the Adriatic coast and belongs to the same ecological unit.

**Table 3: Species Similarity Coefficient Sokal & Sneath (i) between the Sampling Sites**

Sampling Sites	1-Shën Pjetër	2-Kallm	3-Spille	4-Triport
1-Shën Pjetër		24.13%	25.92%	25%
2-Kallm	24.13%		26.76%	25.80%
3-Spille	25.92%	26.76%		23.37%
4-Triport	25%	25.80%	23.37%	

The above consideration can be also supported from the closed values of the Shannon & Weaver index between the sampling sites, as shown in the table 4. These values range from 2.26 in Kallm to 2.47 in Spille.

**Table 4: Shannon & Weaver Index for Each Sampling Site**

Sampling Sites	Shannon Index
Shën Pjetër	2.364
Kallm	2.267
Spille	2.473
Triport	2.324

Taking into account that the sampling sites are close to each other in the linear distance and situated within the same climatic zone, considerations that macro zoobenthic populations in the studied areas may belong to the same

ecological unit can be understandable. It seems that local conditions have a stronger effect on quantitative characteristics of the populations rather than on species composition, comparing the sampling sites that show differences between them concerning the exposure of the coast, underwater topography and environmental human impact.

However, above considerations can remain as hypothesis in the present stage of study, because, as already mentioned above, this data belongs to one season only.

Subsequent analysis of other data, from different seasons in different years and their statistical elaborations will represent a full analysis of species composition, quantitative characteristics, population dynamics and environmental ecological state of benthic communities in particular in each site, as well as the whole benthic community of rocky coast of the Albanian part of Adriatic Sea in general.

## CONCLUSIONS

140 taxa of macro zoobenthos have been recorded in the shallow rocky areas of the Adriatic Coast of Albania during summer (July – August) 2011. This species number can be considered as a relatively high number, taking into account that sampling has been done in very shallow water, during one season only, and that these sites represent very small areas, as short segments of rocky coasts, fragmented and isolated among the sandy coast.

The record of 5 new species for the Albanian coast (*Hexadella racovitzai*, *Trimusculus mammillaris*, *Vexillum savignyi*, *Acesta excavata*, *Musculista senhousia*), as well as two alien species of the Mediterranean Sea (*Rapana venosa* and *Musculista senhousia*) show the relative importance of the studied area for the biodiversity in national scale and the regional importance of the Albanian coast as a corridor for the distribution of alien species from the Ionian Sea northward to the Adriatic Sea.

The groups with the highest presence and abundance were mollusks of the families Patellidae, Trochidae, Cerithiidae, Muricidae, Risoidae and Vermetidae, crustaceans of the families Balanidae, Gamaridae, Grapsidae and Mayidae, as well as the polychaetes Serpulidae. Patellids and trochids show a pronounced dominance in terms of abundance in the whole studied area. Abundance and species composition of macro zoobenthos in the studied area seems to be affected by exposure of the coast, algal cover and human impact. Benthic populations of the studied area may belong to the same ecological unit, extending along Albanian Adriatic coast. The ecological state in the studied areas is unfavorable for the macro zoobenthic community and the stability of this community is low.

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