

Threatened Species of Benthic Invertebrates Along the Rocky Coast of the Adriatic Sea in Albania

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ABSTRACT

This study aimed to represent threatened species of benthic invertebrates, at national and international level, in the rocky areas of the Adriatic Sea in Albania, and to highlight the causes of threats for these species. A total of 58 threatened species of benthic invertebrate were found in the study area, and four sites were selected for investigation: Shën Pjetër, Kallm, Spille, and Triport. A considerable number of these species has a high threatened status, including critically endangered species and vulnerable species. Three species found in the studied area are also threatened on an international scale. Environmental impacts in these areas are mainly related to water pollution and degradation of coastal habitats because of uncontrolled tourism development, as well as coastal erosion. The significant number of threatened species at the national level and the presence of threatened species on the international level highlighted the importance of the rocky shores of the Adriatic Sea in Albania, in terms of conservation and environmental management on the national and international scale.

INTRODUCTION

Rocky areas on the Albanian Adriatic coast denote exceptionally intriguing habitats. These locations constitute brief, disjointed, and isolated segments amidst the prevalent sandy coastline along most of Albania's Adriatic shore, enduring constant erosion. Because of their limited surface area and fragmented nature, their benthic communities are characterized by a high ecological sensitivity (Beqiraj *et al.*, 2011).

Existing data on macrozoobenthos of the Albanian coastline are very limited, sporadic, and mostly in the form of reports, rather than being published in scientific papers (Kashta & Beqiraj, 2009; Beqiraj & Kashta, 2014).

Apart from a recent research that focused on the macrozoobenthos of Vlora Bay, there were limited studies on the macrozoobenthos of rocky areas along the Albanian Adriatic coast. Over the past few years, several studies conducted in this region

have provided data on benthic invertebrates, referring to **Simoni (2011)**, **Ruci *et al.* (2012a, 2012b)**, **Ruci *et al.* (2013a, 2013b, 2013c)**, **Ruci *et al.* (2014a, 2014b)**, **Ndou (2016)** and **Ruci *et al.* (2017)**.

In recent years, the environmental impact on the Albanian coastline, including the areas of this study, has increased primarily because of uncontrolled urban and tourism development. This impact is also reflected on the benthic communities of the affected shores, where certain species are considered indicators of the environmental influence (**Fraschetti *et al.*, 2011**).

These are some of the reasons that highlight the importance of studying the rocky shores of the Albanian Adriatic. It contributes to understanding coastal biodiversity, ecological and environmental sensitivity, and it holds significance in terms of social and economic aspects, considering its connection to the development of coastal tourism.

MATERIALS AND METHODS

The presented data were gathered from benthic surveys along the shallow rocky coasts of the Adriatic Sea in Albania, including Shën Pjetër, Kallm, Spille, Triport (Fig. 1). Shën Pjetër is situated in north-west Albania, and the coastline in this area is composed of small rocks and stones. Kallmi is located in the northwest of the city of Durrës. Its coastline consists of a hard substrate dominated by stones and gravel, extending to Porto Romano. Spille is located on the western coast of Albania, west of Kavaja City, and features a natural coastline composed of large rocks and stones. Triport is situated at the southern end of the Adriatic coast and is characterized by a hard substrate dominated by continuous rock blocks forming belts.

Sample collection occurred in the tidal zone, encompassing the supralittoral, midlittoral, and upper limit of infralittoral. The sampling methodology followed the established standards for benthic sampling on hard bottoms, using a 50 x 50cm frame for quantitative assessment (**Schlieper, 1976; Cattaneo *et al.*, 1978; Drago *et al.*, 1980**). Identification of species and taxonomic nomenclature was based on the following references: **Fauchald (1977)**, **Gargiullo (1991)**, **Pope and Goto (1991, 1993)**, **Riedl (1991)**, **Cossignani (1992)**, **Mojetta and Ghissoti (1994)**, **Millard (2001)**, **D'Angello and Gianuzzi-Savelli (2003)**, **Trainito (2004)**, **CLEMAM (2013)** and **WoRMS (2024)**.

Definition of the threatened status of benthic invertebrates at the national level is referred to the current Red List of the Albanian Fauna, after the Ministry of Environment (2013).

Definition of species threatened at international level is referred to the Annex II and Annex III of the Protocols of the Barcelona Convention (Convention for Protection of the Mediterranean Sea against Pollution), and the Berne Convention (Convention for the Protection of European Wildlife and Natural Habitats).



Fig. 1. Map of Albania with the sampling sites from North to South: 1. Shën Pjetër; 2. Kallm; 3. Spille, 4. Triport

RESULTS

Referring to the Red List of Albanian Fauna (2013), 58 species of benthic invertebrates, which make up about 25% of all species found in this study, are threatened species on a national scale. These species and their threatened status are presented in Table (1).

As shown in Table (2), a considerable number of species have a high threatened status, where 14 species, of which 10 gastropods and 4 bivalves, are vulnerable (VU), while one bivalve species is critically endangered (CR).

Three species found in the studied area are also threatened on an international scale. These species are the bivalve mollusk *Lithophaga lithophaga*, the decapod crab *Maja squinado* and the sea urchin *Paracentrotus lividus*.

Lithophaga lithophaga (rock borer; sea date) is included in Annex II of the Barcelona Convention. This species, during the last two decades, has been intensively collected throughout the Albanian rocky coast, mainly on the Ionian coast, and currently it is already very rare. Although it is a protected species, it is served in restaurants and illegally traded abroad.

Table 1. List of threatened species and their threatened status on national scale in each sampling site: 1. Shën Pjetër, 2. Kallm, 3. Spille, 4. Triport

Species	Threat status	1	2	3	4	Species	Threat status	1	2	3	4
Gastropoda						Bivalvia					
<i>Patella caerulea</i>	VU A1c	+	+	+	+	<i>Barbatia barbata</i>	LR nt	+		+	+
<i>Patella rustica</i>	VU A1c	+	+	+	+	<i>Mytilus galloprovincialis</i>	VU A1c	+	+	+	+
<i>Patella ulyssiponensis</i>	VU A1c	+	+	+	+	<i>Mytilaster minimus</i>	CR D1		+	+	+
<i>Diodora graeca</i>	VU A2b	+				<i>Lithophaga lithophaga</i>	VU A1a	+			
<i>Jujubinus striatus</i>	LR nt	+				<i>Spondylus gaederopus</i>	LR nt				+
<i>Jujubinus exasperatus</i>	LR1c		+			<i>Ostrea edulis</i>	LR nt	+		+	+
<i>Gibbula adriatica</i>	LR nt	+	+	+	+	<i>Chama gryphoides</i>	DD	+		+	+
<i>Gibbula ardens</i>	LR nt		+	+		<i>Parvicardium exiguum</i>	DD		+		
<i>Gibbula divaricata</i>	LR nt	+	+	+	+	<i>Irus irus</i>	LR nt		+	+	
<i>Phorcus articulatus</i>	LR nt	+	+	+	+	<i>Venerupis corrugata</i>	VU A1a	+	+	+	+
<i>Phorcus turbinatus</i>	VU A2b	+	+	+	+	<i>Ruditapes decussatus</i>	VU A1a	+			
<i>Tricolia pullus</i>	VU D2	+	+	+	+	Crustacea					
<i>Tricolia tenuis</i>	VU D2		+	+	+	Malacostraca					
<i>Cerithium vulgatum</i>	LR1c	+	+		+	<i>Athanas nitescens</i>	LR nt				+
<i>Bittium reticulatum</i>	VU D2	+	+	+	+	<i>Eualus cranchii</i>	DD				+
<i>Epitonium clathrus</i>	LR nt		+			<i>Ethusa mascarone</i>	LR nt		+	+	
<i>Pusillina lineolata</i>	LR/cd	+	+	+	+	<i>Pisa tetraodon</i>	LR nt		+		
<i>Pusillina marginata</i>	LR/cd		+	+		<i>Maja squinado</i>	LR/ cd		+		
<i>Alvania lineata</i>	DD	+	+	+	+	<i>Liocarcinus vernalis</i>	LR nt		+		
<i>Luria lurida</i>	EN B2a		+			<i>Pilumnus hirtellus</i>	LR nt		+	+	+
<i>Hexaplex trunculus</i>	LR nt	+	+	+	+	<i>Eriphia verrucosa</i>	LR nt			+	+
<i>Ocenebra erinaceus</i>	LR nt		+	+	+	<i>Brachynotus sexdentatus</i>	DD				+
<i>Ocenebrina edwardsii</i>	LR nt	+	+	+	+	Echinodermata					
<i>Muricopsis cristatus</i>	LR nt	+	+	+	+	Holothuroidea					
<i>Stramonita haemastoma</i>	VU D2	+		+	+	<i>Holothuria tubulosa</i>	LR/cd		+		+
<i>Coralliophila meyerdorffii</i>	DD			+		Echinoidea					
<i>Vexillum ebenus</i>	LR nt	+	+		+	<i>Arbacia lixula</i>	LR/cd	+	+		
<i>Euthria cornea</i>	LR nt	+	+	+	+	<i>Paracentrotus lividus</i>	LR/cd	+		+	
<i>Polia dorbignyi</i>	DD	+	+	+	+	Asteroidea					
<i>Nassarius incrassatus</i>	DD	+	+	+	+	<i>Asterina gibbosa</i>	LR/cd	+			+
<i>Nassarius mutabilis</i>	VU C2a			+							
<i>Nassarius reticulatus</i>	LR nt		+	+							
<i>Mitrella scripta</i>	DD		+								
<i>Tarantinaea lignaria</i>	LR nt	+	+		+						

As it can be seen from the list above, of the nationally threatened species, 34 are gastropods, 11 bivalves, 9 crustaceans and 4 echinoderms.

Table 2. Number of species and their threatened status for each group of benthic invertebrates

Taxa	Gastropoda				Bivalvia				Crustacea		Echinodermata
Threat status	VU	LR	DD	EN	VU	DD	CR	LR	DD	LR	LR
Number of species	10	18	5	1	4	2	1	4	2	7	4

Maja squinado is included in Annex III of the Barcelona Convention. In Albania, this species is collected as bycatch from fishing, and its trade is not very common.

Paracentrotus lividus is included in Annex III of the Barcelona Convention, as well as in the list of the Berne Convention. This species of sea urchin is not traditionally present in the local market, but in recent years it has been collected for illegal trade abroad.

Many of the threatened species found in this study are threatened by direct harvesting for trade in local markets and restaurants, while many others, although not objects of trade, face threats from coastal habitat degradation and water pollution resulting from human impact, primarily through tourism and urban pollution.

In the area of Shën Pjetër, coastal erosion and pollution from the Ishmi River are among the most important environmental impacts, according to **Kashta and Beqiraj (2009)** and **Beqiraj and Kashta (2014)**. In addition, this area is also under the increased tourist influence during the summer due to the ever-growing tourist developments in Lalzi Bay to the south of Shën Pjetër. The presence of a significant number of threatened species in this site is important for the whole Rodoni Cape area since this area has been proposed to be declared a Marine Protected Area.

In the other three studied areas, Kallm, Spille and Triport, environmental impacts are mainly related to water pollution and degradation of coastal habitats from tourism development.

The significant number of threatened species at the national level highlights the importance of the rocky shores of the Adriatic Sea in Albania, both in terms of conservation and environmental management at the national level. From this perspective, we believe that the involvement of these areas in the national environmental monitoring plan could be of interest.

Although in small numbers, the presence of 3 species of benthic macroinvertebrates threatened on an international scale shows the importance of the Albanian shores of the Adriatic at the regional and international level.

Lithophaga lithophaga is a bivalve with a particular importance, as one of the most legally protected species in almost all Mediterranean countries. The collection of this species, taking it out of the rocks, is accompanied by the breaking and massive damage of the rocks, including various benthic biocenoses. For this reason, the protection

of this species takes a special importance for the protection of coastal rocky habitats. Furthermore, this is crucial for the rocky shores along the Albanian Adriatic, encompassing the study areas, as these regions are small and fragmented. Damage to benthic populations here could result in irreversible loss.

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