

CHARACTERISTICS OF MACRO-ALGAE BIOMASS FROM ROMANIAN BLACK SEA COAST

Maria Nastac, Karina Gheorghiu, Iulia Mihu

ASSOCIATION FOR THE PROTECTION OF HUMAN BEING AND ENVIRONMENT FOR A SUSTAINABLE DEVELOPMENT IN THE WORLD – ECOM,
10 Patriei Street, Constanta, Romania 900527, tel +4-0241672835
Email: marianastac@ecomct.ro

Abstract

At the Romanian Black Sea Coast envelopment of macro-algae mass is reported mainly in summer and is registered especially by the group green macro-algae; thus the largest deposits occur ashore after periods of storm especially, but especially after bottom movement, when a large area of shallow coastline is "shaved" of vegetal carpet. Most macrophytes algae from the Romanian littoral are seasonal species; typical for low temperatures are species of red algae: *Bangia*, *Porphyra* and *Ectocarpus*; species *Dasya*, *Chondria* are typical for the summer temperatures and others are frequently met especially in spring – fall; in addition to these, a number of species belonging to the group of green algae. *Enteromorpha*, *Cladophora*, are present in all associations succeeding in the year.

Keywords: Black Sea Coast, macro-algal species, vegetal carpet, shallow littoral.

1. INTRODUCTION

The Romanian seaside is located in the South East of Romania, including the Eastern limits of Constanta and Tulcea counties. The coastline has a length of 245 km and is bonded to the North side of flowing into the sea of the Musura River who makes common border with Ukraine. The border with Bulgaria is situated at 2 km from the resort of Vama Veche.

The Romanian coastal zone is divided in two geographical and geomorphological units (Băcescu et al., 1971):

- Northern unit (N, Fig.1) occupies 2/3 of the littoral length, it lays between Musura Bay, at the mouth of Chilia branch, and Cape Singol, including the shore of Danube Delta Biosphere Reserve. This area is characterized by sandy beaches, with low altitudes and reduced as amplitude sub-marine slopes.

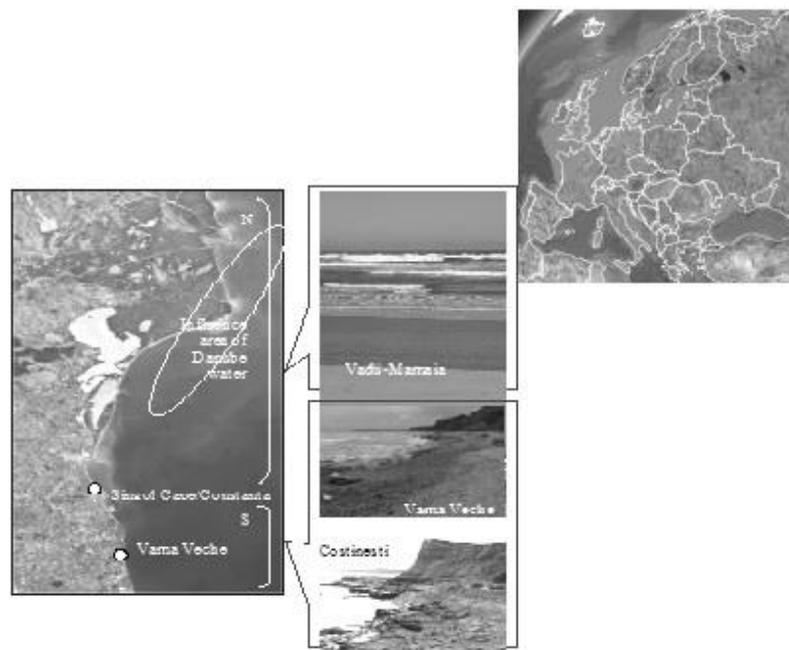


Figure 1. Romanian littoral of the Black Sea

- Southern unit (S, Fig. 1), occupying 1 / 3 the length of the Romanian seaside, lays between Cape Singol and Vama Veche, and is characterized by narrow beaches, interrupted by limestone platforms

that extend over the water and high cliffs; shallow sediments include a large variety of molluscs shells and pebbles, these beaches being composed of sand with average and coarse particle size.

2. MATERIAL AND METHOD

Observations and collection of algae for qualitative determination was made monthly, especially after storm periods, to identify the dominant perennial and seasonal species, and to capture the different stages of the development cycle. Fresh algal samples were taken in the laboratory, washed of the associated fauna and sorted in the main groups; the sampling is done so that the estimation of the abundance can be done (after density and biomass); the classical procedure of sampling the "square sample" used for this purpose was unanimously supported by specialists in the world community.

Samples are obtained by integral collecting of plant biomass by scraping the substrate corresponding to a square sample; for each sample at least one replicate was taken; samples are stored in the chest freezer and will be processed in the laboratory. Photographs in the field, before taking samples, will complete the picture of the structure of macro-algal associations from the southern part of the Romanian coast.

3. RESULTS

Macrophytes recorded mass development during periods of optimal thermal and nutrients regime, as follows: species of group chlorophyte group (Tab.1): *Urospora penicilliformis*, red algae species, *Bangia fuscopurpurea*, *Porphyra leucosticta*, *Ectocarpus siliculosus* are frequently met in February and May, while species *Dasya*, *Chondria* appear during summer; cosmopolite species belonging to genus *Enteromorpha* (*E. intestinalis*, *E. compressa*, *E. linza*, *E. flexuosa*, *E. prolifera*) *Ulva rigida*, *Ceramium* (*C. elegans*, *C. diaphanum*) are present in all the associations follow one another during the year. Perennial algae: *Cystoseira barbata* and *Cy. bosporica* from the shallow rocky littoral areas and *Phyllophora nervosa*, *Ph. brodiaei* from greater depths of circalittoral, but until 50 m (almost 50 years ago a wide field of about 11000 km², in the N-W part of the sea was described as a true red "plain" formed by species of genus *Phyllophora* – with a biomass over 5-6 million t; this representing one of the basic biological characteristics of the Black Sea (Sava, 2002).

Observations and studies that we have done over several years (2009 - 2012) enabled us to identify the two summer periods in which large amounts of macro-algae are detached from the substrate and bonded to the shore (especially in the group of green algae - Chlorophyta): in June – August (Fig. 2, Fig. 3, Fig. 4, Fig 5).



Figure 2. Macro-algae deposit from the shore area of the southern Romanian littoral of the Black Sea.

Table 1: The most abundant algae species identified in algae agglomerations on the shore.
(after Sava, 2006)

Nr. Crt.	Taxonomic group	Species
CHLOROPHYCEAE		
1	Ulvales	<i>Ulva rigida (lactuca)</i> (L.)
2		<i>Enteromorpha intestinalis</i> (L.) Link.
3		<i>E. compressa</i> (L.) Grev.
4		<i>E. linza</i> (L.) Ag.
5		<i>E. flexuosa</i> (Wulf.) Ag.
6		<i>E. prolifera</i> (O.Múll) J. Ag
7	Cladophorales	<i>Urospora penicilliformis</i> (Roth.) Aresh
8		<i>Cladophora vagabunda</i> (L.) Hoek.
9		<i>C. sericea</i> (Huds.) Kütz.
10		<i>C. albida</i> (Huds.) Kütz.
11.	Bryopsidales	<i>Bryopsis plumosa</i> (Huds.) Ag.
12		<i>B. hypnoides</i> Lamour
ISOGENERATAE - PHAEOPHYTA		
13	Ectocarpales	<i>Ectocarpus siliculosus</i> (Dillw.) Lyngb.
CYCLOSPOREAE - PHAEOPHYTA		
14	Fucales	<i>Cystoseira barbata</i> (Good et Wood) Ag.
FLORIDEOPHYCEAE-RHODOPHYTA		
15	Ceramiales	<i>Callithamnion corymbosum</i> (Smith.) Lyngb.
16		<i>Ceramium rubrum</i> (Huds) Ag.
17		<i>Ceramium elegans</i> (Roth.) Ducl.



Figure 3 *Ulva rigida*



Figure 4. *Enteromorpha intestinalis*



Figure 5. *Cladophora vagabunda*

4. DISCUSSIONS

In addition to natural factors such as prolonged periods of freezing from the Romanian seaside in the years '70 -'80, the emergence of high intensity storms, the anthropogenic factors have had an important contribution (Sava, 2006); studies in recent years have shown a significant decrease in the number of species of algae covering the shallow littoral south of Constanta (Table 2), and this was made on behalf of human impact stemming mainly from the work of the Port of Constanta South Agigea (large amounts of fine clay sediments reached the water through port works and hydrotechnical works, determining decrease of transparency and change of shallow bottom waters because the sediments that were deposited on hard substrate created a mobile substrate and prevented macro-algae deposition).

All shoreline protection works (against beaches erosion and for tourist activities) caused changes in the movement of littoral currents, being created areas with low dynamic of water bodies and thus eliminated rheophile/oxygenophile species in these areas.

Table 2. The decrease of the number of macrophyte algae species during 1977-2007 (data after Sava, 2007)

Phyllum	After data:		
	Bavaru 1977	Vasiliu 1980- 1995	Sava 2007
Chlorophyta	31	22	16
Phaeophyta	14	9	5
Rhodophyta	41	24	10
Total	86	55	30

Today only about one third of the total number of macro-algae species is encountered, compared to species cited 50 years ago; this has allowed the mass development of cosmopolitan, opportunistic, short life cycle species, especially belonging to the group *Chlorophyta* (green macro-algae); the most significant decrease is recorded for red (31 species in this group no longer being found on the Romanian seaside in the past 50 years) and brown macro-algae species (9 species). An important ecological niche for the development of marine benthos on hard substrate of the littoral part from the south of Constanta was represented by the "field of *Cystoseira barbata*"; currently in this field have left only small "oasis" with a very reduced surface (Sava et al., 2007).

5. CONCLUSIONS

The most important features of macro-algal communities in the southern Romanian Black Sea coast, are:

- reduced number of species in groups of red and brown macro-algae;
- proliferation of opportunistic species of green macro-algae group, with short life cycle and which can develop impressive biomass in a relatively short time; these few species occupies 80% area of shallow sea bottom;
- reduce the area occupied by perennial macro-algae, *Cystoseira* and *Phylophora*.

To improve the existing situation is necessary to popularize the importance of species (rare species and especially of perennial ones) on one hand, and to recover large amounts of macro-algae biomass produced during summer on the other hand.

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