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CHARACTERIZATION OF SEA GRASS IN VILUN LAGOON
KARAKTERIZIMI I LIVADHEVE NËNUJORE TË LAGUNËS SË VILUNIT

ARJANA YLLI[1], ILIRIANA STAMO[1], FATBARDHA BABANI[1], ALFRED MULLAJ[2]
[1]Department of Biotechnology, University of Tirana, Tirana, ALBANIA
[2]Museum of Natural Sciences, University of Tirana, Tirana, ALBANIA
ariana_ylli@yahoo.co.uk

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PERMBLEDHJE
Livadhet nën ujore janë një nga habitatet më të rëndësishme dhe vitale të Lagunës së Vilunit për peshqit dhe gjallesat. Bimët e lagunës janë të afta të prodhojnë oksigjen në mungesë të ndriçimit. Vlerësimet e pigmenteve fotosintetike të bimëve Zostera noltii dhe Ruppia cirrhosa dhe gjendja e këtyre bimëve është kryer në periudhën 2004-2005 në Lagunën e Vilunit. Gjatë periudhës prill - tetor ne gjetëm vetëm bimën Zoostera noltii në stacionet e brendshme, ndërsa gjatë periudhës qershor - tetor ishte edhe në dy stacionet e tjerë. Bimët e Ruppia cirhosas shfaqen në shtator - tetor. U vlerësuan pigmentet fotosintetike të livadheve nënujore të Zostera noltii dhe Ruppia cirrhosa, të cilat përfaqësojnë speciet kryesore të Lagunës së Vilunit, pranë Shkodrës. Vlerat e klorofilës a në stacionet 1 dhe 2 ndryshonin ndërmjet 0.744 mg/g – 1.207 mg/g dhe vlerat e klorofilës b varionin midis 0.277 mg/g - 0.507 mg/g. Gjithashtu janë vlerësuar karotenoidet gjatë periudhës së vegjetacionit të këtyre bimëve.
Fjalë kyçe: karotenoidet, klorofil, pigmentet fotosintetike, Ruppia cirrhosa , livadh nënujor, Zostera noltii.

SUMMARY
Sea grass is one of the most important and vital habitats of Vilun Lagoon for the fish and the wildlife. Lagoon plants are capable to produce oxygen in the absence of light. Characterization of photosynthetic pigments of plants Zostera noltii and Ruppia cirrhosa, were performed during the period 2004 - 2005 in the Vilun Lagoon. During April - October period are found Zoostera noltii only in inner stations, while during July – October are found it also in two other stations. Ruppia cirhosa plant was appeared during September – October period. Are evaluated the photosynthetic pigments of sea grass Zostera noltii and Ruppia cirrhosa, which represent the primary species in Vilun Lagoon, near Shkodra. In station 1 and 2 values of Chlorophyll a varies between 0.744 mg/g– 1.207 mg/g and Chlorophyll b varies between 0.277 mg/g - 0.507 mg/g Also carotenoids during the vegetation period of these plants were evaluated.
Key words: carotenoids, chlorophyll, photosynthetic pigments, Ruppia cirhosa, seagrass, Zostera noltii.

INTRODUCTION

The Vilun Lagoon of Adriatic cost exists as transitional environments between land and sea represented temporally changeable environments. Each of them is partially isolate from the sea by sand bars, whereas the direct exchange with sea is only occurring at the inlets that individually connect the different part of lagoon with sea. The lagoon consists of a number of interrelated habitats. The terrestrial and aquatic parts of lagoon host a number of organisms and diverse communities. The average depth of the lagoon is approximately one meter. Most of the circulation within the lagoon takes place through the network of channels and tidal creeks. At the base of the food chain, many species of fish feed on, or take shelter in, these beds during different stage in their life cycle. Sea grass beds filter excess nutrients out of the water and help prevent shoreline flooding and erosion

by stabilizing sediment and buffering wave action (3, 5).

There are two species of seagrasses native to the Adriatic Lagoons: *Zostera noltii* and *Ruppia cirrhosa* that usually colonize beds. They generate water meadows and their population cover 40 – 50 % of the surface. Seagrass is an important element of lagoon bed vegetation. Immense meadows of seagrass covered lagoon beds, consolidating them with its complex system of roots. Meadows of seagrass were once very widespread on lagoon beds. Due to the deterioration of water quality, the amount of eelgrass has considerably decreased, causing an increase in the erosion of the lagoon beds. The growth of this plant has now greatly diminished, and algae species have spread throughout the lagoon, due to the increase of the urban activity and pollutions (4, 8).

Zostera noltii and *Ruppia cirrhosa* growth are seasonal and closely related to environmental temperature. Growth generally occurs during the spring and summer, from April to September. *Zostera* invests a large proportion of its resources in the maintenance of rhizomes and roots. The underground mat of horizontal rhizomes branches during growth, producing vertical leaf shoots, which are responsible for the lateral expansion of patches. Seagrasses populations can therefore expand either by the vegetative growth of shooting rhizomes that have survived the winter, or sexually, by production of seed (5, 7, 8).

The extensive rhizome networks and above-ground leaf meadows of seagrasses create a complex biota that significantly affects the functioning of the local coastal ecosystem and also provides a habitat for a diverse range of organisms. Water clarity is also very important, as this affects the amount of light available for photosynthesis and so determines the depth to which the plants can grow.

MATERIAL AND METHODS

The species of seagrass meadows *Zostera noltii* and *Ruppia cirrhosa* at Vilun Lagoon are monitored during the vegetation period from April to October in two consecutive years 2004 and 2005. In the first year 2004 we collected samples in two stations (1 and 2) and during the second year 2005 we collected samples in the four stations (Fig. 1). Three monitoring stations are in the inner part of lagoon and the fourth near the channel. The photosynthetic pigments, *chlorophylls a* and *b* and the *carotenoids* play the important role in the synthesis of the organic substance, biosynthesis of photosynthetic pigments, as well as the reflectance and fluorescence imaging patterns. Today the study of leaf fluorescence signature via imaging techniques, in order to estimate the multi-stress tolerance in plants is applying successfully. Fluorescence values of the four major bands (F470, F645, F652 and F663) and their ratios are sensitive stress indicators. The content of photosynthetic pigments, *chlorophylls (a+b)* and *total carotenoids (x+c)* of seagrass *Zostera noltii* and *Ruppia cirrhosa* was determined in the same 80 % acetone extract solution using the reevaluated extinction coefficients and equations of Lichtenthaler (6). Chlorophyll content is used as criterion to determine the state of the lagoons.

Coordination of the Vilun lagoon
St.1 N 41° 52' 09,6"; E 019° 26' 42.3"
St.2 N 41° 52' 05.2"; E 019° 27' 03.6"
St.3 N 41° 52' 00,8"; E 019° 27' 05.1"
St.4 N 41° 51' 46.4"; E 019° 26' 53.3"

Figure 1. Monitoring stations in the Vilun Lagoon

RESULTS AND DISCUSSIONS

There are two species of seagrass native to the Adriatic Lagoons: *Zostera noltii* and *Ruppia cirrhosa* that usually colonize beds. They generate water meadows and their population cover 40 – 50 % of the surface. Seagrass is an important element of lagoon bed vegetation. Vast meadows of seagrass covered lagoon beds, consolidating them with its complex system of roots. Meadows of seagrass were once very widespread on lagoon beds. Due to the deterioration of water quality, the amount of seagrass has considerably decreased, causing an increase in the erosion of the lagoon beds. The growth of this plant has now greatly diminished, and algae species have spread throughout the lagoon, due to the increase of the urban activity and pollutions (1, 2).

The monitored Adriatic lagoon shows the greatest overall losses of seagrass *Zostera noltii*, which used to be the primary species decreased most dramatically. Dynamics of photosynthetic pigment, chlorophylls and carotenoids, during the vegetation period of monitored seagrass *Zostera noltii* demonstrated their higher values during summer, from May to September (Fig. 2).

Figure 2. *Zostera noltii* and *Ruppia cirrhosa* in Vilun Lagon.

During 2004 and 2005 monitoring in Vilun Lagoon the temperature of water is increased with 10°C between April and May. The temperatures measured in the four stations are nearly the same during each samples collection. pH measurements in four stations belong to the interval (6.6 – 8.0) during the monitoring period.

The assessment of pigment contents of *Zostera noltii* and *Ruppia cirrhosa* in Vilun lagoon are shown in Fig. 3, 4 and 5. Both seagrasses plants were fund as elements of lagoon bed vegetation, showed the higher chlorophyll content of *Zostera noltii* than of *Ruppia cirrhosa*. Also, the values of the ratio (a+b)/(x+c) of *Zostera noltii* were higher than of *Ruppia cirrhosa*, indicating higher relative chlorophyll content compare to carotenoids of *Zostera noltii* compare to *Ruppia cirrhosa*. Chlorophyll content as well as the relative content of chlorophylls to carotenoids of *Zoostera noltii* collected from the water meadows of Vilun Lagoon were very high (1, 2).

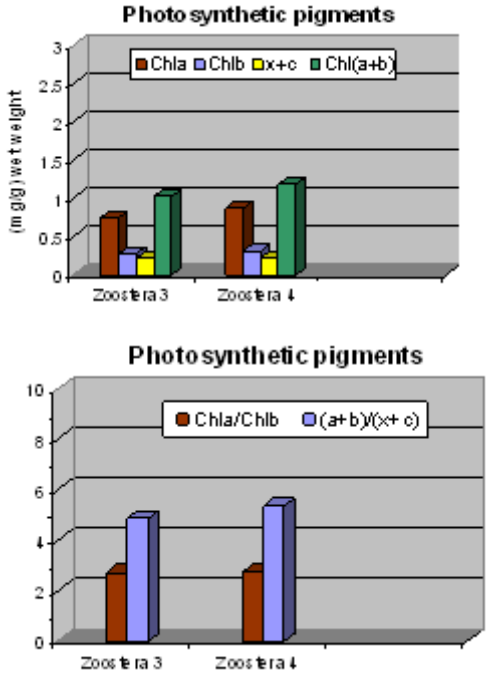

Figure 3. Photosynthetic pigment content of *Zostera noltii* plants in April 2005

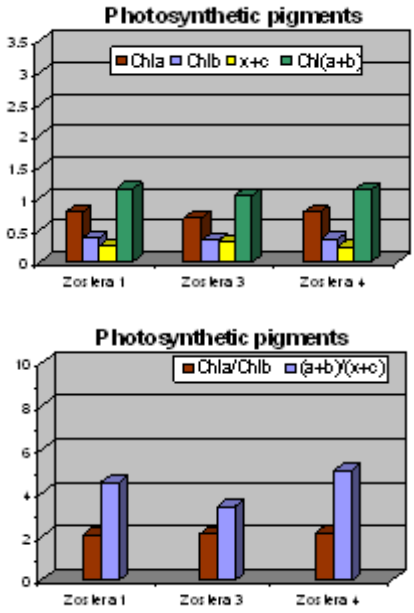

Figure 4. Photosynthetic pigment content of *Zostera noltii* plants in July 2005

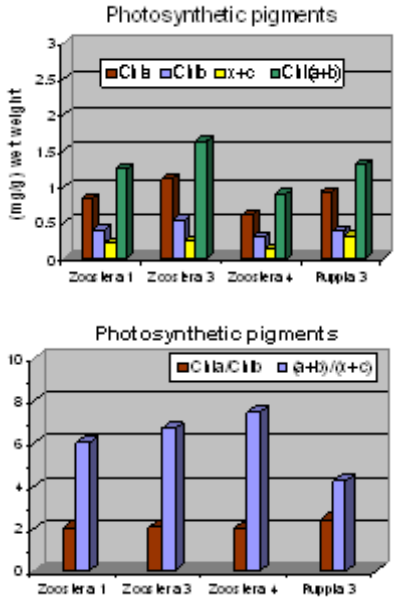

Figure 5. Photosynthetic pigment content of *Zostera noltii* and Ruppia cirhosa plants in September 2005

During 2005 monitoring in Vilun Lagoon seagrass plants in station 1 (inner area of lagoon) are collected after July (2004 and 2005) as is shown in Fig. 4, and in October *Zoostera noltii* had the highest values of photosynthetic pigments (Fig. 5). The stations number two is near the urban activity and the growth of this plant has now greatly diminished, and algae species have spread throughout the lagoon, due to the increase of water pollution.

In September, in Station 3 are collected *Ruppia cirrhosa* plants with very high photosynthetic pigments: *chlorophyll a* 0.924 mg/g, *chlorophyll b* 0.383 mg/g, *carotenoids* 0.308 mg/g (Fig. 5). In October we collected in Station 3 very small quantity of *Ruppia cirhosa* plants, that it was not possible to extract photosynthetic pigments (Fig. 5). Significant ecosystem-level effects include the stabilization of coastal sediments and the production of organic detritus.

Several forms of anthropogenic water pollution can cause loss of, or damage to *Zostera* beds. This can occur rapidly, for example where plants are killed by water-borne toxins or smothered by oil, or over a longer time-scale, as when nutrient input causes eutrophication, with associated increases in turbidity and proliferation of epiphytic algae. This is very important for ecosystems in lagoons. The seagrass restoration efforts should be focused exclusively on water quality improvement. Once the right conditions are established, seagrass will naturally recolonize.

CONCLUSIONS

Based on the data analyzed through monitoring systems during two consecutive years (2004-2005) in four stations of Vilun Lagoon and evaluation of other similar ecosystems of the Albanian Adriatic cost, we could present the following conclusions:

- Seagrass restoration is complicated by the fact that seagrass beds are extremely sensitive to water quality.
- The photosynthetic pigment content of the *Zostera noltii* plants is higher than of *Ruppia cirrhosa*.

- The differences on the distribution of these species in the analyzed lagoons were observed.
- The lagoons show the greatest overall losses of seagrass; *Zostera noltii*, which used to be the primary species, decreased most dramatically.
- The deterioration in water quality has been largely responsible for the loss of seagrass.
- In areas where water quality will be improved, physical restoration of seagrass through transplantation or seeding can accelerate the plants re-establishment.
- The seagrass restoration is threatened by physical damage of restored beds through dredging, aquaculture, and propeller scarring.
- The long-term survival of *Zostera* beds requires equilibrium between the processes of sediment accretion and erosion.

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