GEOMORFHOLOGICAL AND GEOBOTANICAL FEATURES OF THE COASTAL AREA IN THE SOUTH OF THE VJOSA RIVER (VLORA BAY , IONIAN COAST)

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ABSTRACT

This paper is based on the existing materials collected during field trips and plant analysis from geobotanical data surveys represents the lithosructural, geomorphological and geobotanical features of the coastal area in south of Vjosa River. The study area in an original morphostructural , geomorphologic and bio- climate unit with a rich and various flora and fauna. Based on geobotanic analysis, it represents the plant communities, habitats. We have to pay attention for risked plant communities, habitats and plants with the risk categories according to IUCN standards. Some of thosc plants are endemic, like Orchis Albania Goelz & Reinhard /E/, in sands of Vlora, Leukojum valentinum Pau.ssp vlorense paparisto et Qosja/E/, in the fissures of calcareous rocks of the coast of Vlora (Kala)

Hypercium haplophylloides halacsy & Bald. / R/ , in calcareous rocks of Llogara. At the end are given some recommendations for protection and sustainable management of the region, conservation and regeneration of the values of the vegetation diversity and the landscape.

INTRODUCTION

The study area represents an original geomorphological, morphostructural and bioclimatic unit (fig.1). Vlora bay is included in Ionian coast as well. This area is the greenest part of the Albanian coast, named "Albanian Riviera", which is beautiful and clean in the whole Mediterranean. This zone about 180 km long. It is exposed along Northwest-Southeast direction. It has the same position as the main morpho-tectonic units of the south mountain region of Albania. Such orientation of the coastline is perpendicular with the delta of the main rivers from one side and of dominant winds and sea waves on the other side is effected in the coastal morphology, in its type and evolution rates.

The Flora and vegetation are important elements of natural resources of this specific region. So, they merit deep Knowledge, right evaluation and special care. The authors try to assess the geobotanical and geomorphologic resources of this area, suggesting scientific recommendations for its reasonable protection and management. The study area is highly populated (there are ten villages and three towns). It has high tourist potential, so the human impact must be planned according to its evolution. At the same time it is necessary to consider the fact that the coastal ecosystems change rapidly from human and natural impacts. We are in the stage of massive impacts and future tourism. The tourism is one of the priorities for the economic development of the study area.

MATERIAL AND METHODS

For the compilation of this study was set up a field check group. From these surveys were collected a lot of data on stratigraphy, tectonic and geomorphology. Measures and direct surveys arrived out about microclimate issues and coastal development as well (e.g. annual intensity of coast erosion). Determination of plants communities was based on geobotanical surveys and data elaboration in the office /4/. During the field surveys special attention was given to select the most representative samples for the geobotanical analysis. They were extracted on selected areas (slope, exposure, elevation , etc.), in order to represent the vegetation most appropriately. Their quantity and size was selected according to their minimum plant and plants communities is determined using the IUCN defined categories /10/. We used successfully the questionnaires organized with the inhabitants for different problems, as special climate and meteorological events, deforestation or other human impacts, in environment. We used a broad literature / 1,2,3 „6,7,8,9,11,12,17/ including papers, notes , maps from country and foreign authors for the study area.

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THE RESULTS AND DISCUSSION

Lithostructural features , seismics

According to the theory of plate tectonics the Ionian coast is located on the margins of two overlapping tectonic plates toward the west (the Albania - Balcanic plate with the Adriatic plate). In this region there are the Ionian structural-tectonic zone and the Sazan - Karaburun zone. Those zones are displaced to each other and composed from Mesozoic calcareous (of akuitanuan - buldigalian) with few of quaternary teorogens and deposits (coastal or continental)

The above mentioned formations are organized in some anticline and synclinal structures, as Cika, Karaburun -Rreza e Kanalit anticline that are divided from Ducati synclinal. The last one is sprained and hidden by the overlapping of two anticline structures /12/. The anticlines are asymmetric with normal east side , but the west side is masked and fallen down. This has its effects in the relief. The ridge of mountains fall slantingly toward the coast and they are very steep and gradual , consequently of the tectonic complication of the structure of scale and overlapping type caused by drawing and lifting up. The Vlora - Dhermi fault (parallel with structures) and Borshi fault (transversal one). The neotectonic movements and especially differential ones represent with mountains (2025 m), coastal terraces , hole inter-mountains (Delvina basin, Ducati basins). This has stimulated the foreign modeling process activities, especially the karst and fluvial processes.

The study area has started its paleographic evolution after the definitive coming out over the water , at the same time with (Plio-quaternar) neotectonic differentiation of the structures that exists in the present day. Because of the Pliocene-quaternary differentiation movements was formed the Vlora bay , Sazani island is divided from Karaburuni lake /2/. Front that time coastal mountains were continuously lifted up , so the sea is retrited. The facts of the previous coast traces are the existence of coastal terraces of Albanian rivers towards the coast have a good and sustainable basement according to geological engineering aspect. There are frequently earthquakes with different magnitude and intensity, as in the Delvina basin zone, Vlora bay, etc. These zones have a seismic potential from magnitude 5 - 7 degree of Richter scale (to the epicenter).

Geomorphological features

The area between the delta of the Vjosa and Pavilla rivers is estimated as a special physical-geographical region with original morphostructural, morphogenetic and bioclimatic features. There is a considerable hypsometrical amplitude (2000m). This is directly connected with neotectonic differentation and high intensity of the raise of the mountain region. This factor together with the displacement toward the west formed a relief with considerable energy and slope (dominated by the slope 10-25 degree). Between the foreign factors we can mention the karst, fluvial and sea activities. The karst relief is dominant. This shows the influence on the environment not only in the morphology but in hydrology, specific soils, fauna and flora as well. The vegetation is different from the other regions, rich with Kserofilus types, which resist to high temperatures during the summer.

The surface hydrologic network is poor, with temporal flows depending directly on precipitation. But the underground flows are numerous and complex, thus contributing to the considerable number of water resources distributed all over the area. Some of them are open to the sea like in Uji i Ftohte, Qeparo, Birsh, etc.

>From geomorphological viewpoint the study area is divide into three parts: the coast of Vlora (Delta of Vjosa - Peroi i Palases), the coast of Himara (up to Qeparo) and the coast of Saranda. The first two sectors have the altitude up to 2000m (Cika mountain). The relief is formed mainly by calcareous and is dominated by karst landscape. In the third sector, the terrigenes can be found together with calcareous (Borsh, Lukove) and the relief is coming gradually down (the maximal altitude is less than 1000m).

The coastline is fragmented with a lot of snake shapes. There are capes, islands, peninsulas, bays and small beaches. Important elements are the lagoons (Narta, Butrinti), that are specific coastal ecosystems of scientific, economic and tourist interests.

In function of the dominant geomorphological process there is the abrasive coast type, very high, rocky (of the Dalmat type) with high terraces and in special sectors the accumulative ones. The dominant terraces have altitude of 50-60m (Panorme, Filikure). We can find terraces with altitude 80-100m and some times 150m /7,8/. Such types are located in Karaburum, Sazan island. Manly they are active terraces created in sandy lands (Borsh, Treporte, Lukove, etc.), that have small altitude and are reshaped more rapidly by the sea.

The bays and beaches are numerous, have small sizes (excluding the bay of Vlora). The tectonic movements in negative directions from the bays (down). Most important are: bays of Vlora, Spile, Portopalermo, Qeparo, Borshi, Kakoma, Saranda. In the bays are located the main beaches of the area. The rivers supply the beaches with material at the coastal areas (Vlora, Dhermiu, Spile, Qeparo and Borshi beaches). The beaches are also receive material from the sea itself. The sea deposits the eroded materials in the sectors depending on dominant winds and sea streams.

A great influence has the depth of the Ionian sea, the period of the waves, the direction and the velocity of the winds and the morphology of the coastline. The sea isoline 10m is very near the coastline, but the 100m and 50m are far from the coast in Birshi and Saranda. The continental shelf is broader. In the two endpoints of the study area are formed two lagoons. The Narta Lagoon (331km2) and the Butrinti lagoon, which represent the specific ecosystems with special scientific, aesthetic, tourismand economic values.

Geobotanical characteristics

Flora and the coastal vegetation in the south of Vjosa represent two views: 1) from Vjosa in Vlora and 2) from Vlora in the rest Ionian coast.

The variety of habitats in the coastal area in the south of Vjosa caused the placement of different types of vegetation in it. We can mention:

Vegetation of dunes and the low coast lands. This type of vegetation is characteristic for the coastal area from Vjosa in Vlora. It is part of Albanian west lowland (Adriatic coast), but can be found in the Ionian coast as well (Butrinti area). The vegetation of dunes and the coastal lowlands is more or less with common features with plants communities not only in the albanian coast but also with other Mediterranean countries. This is determined mainly with specific features of this environment like sandy lands, dry lands or sufficient water (wetlands and lagoons) and saltiness of soils.

According to the environment / habitats we have:

Psamo-and psammonitrophyle vegetation. In the vegetation most near to the sea, after the narrow belt of the sand without vegetation. This vegetation is located over the sandy dunes. Can be distinguished the plant communities with Ammophila arenaria, with Elymus farctus and with Sporobolus pugens, which gives to the dunes of Pishλ-Poro e special beauty. They are the most characteristic ones protected in albanian coast. We can find the pioneer beach vegetation, where can be focused the plant communities with Cakile maritima and psammonitrophyle vegetation represented by plant communities with Aptriplex tatarica-hartata.

Halo-and halohygrophyle vegetation (salty wetlands). Its surface is decreasing because of the saltless and the generation of new agriculture lands, but this surface is still considerable. We can find it in the Ionian coast (Butrinti zone) too. In the salinity we can see: plant communities annual pioneer with Salicornia europaea and with Suaeda maritima, plant communities stabilized with Arthrocnemum sp. div., with Artemisia caerulescens and with Limonium vulagare. In the salty wetlands there are more plant communities with Juncus maritima and with Schoenus nigricans. All those plant communities we can find in the broad field from Gjoli i Nartλs up to Poro, name jalli (broad field of salty wetlands covered mainly with Arthrocnemum sp. div.).

Grass vegetation of uncultivated lands. It is a limited surface. Most characteristic feature is the existence of fresh uncultivated lands with plant communities of Lolium perenne, of Dittrichia viscosa and of Ranunculus velutinus more frequently in alluvions. But we can find some dry uncultivated lands with plant communities of Erianthus strictum, of Dactylic glomerata and of Aegilops triuncialis.

Vegetation of lower river beds and fresh water lands (hygro-hygrohydrophyle). This type of vegetation occupies a small surface but its biodiversity has great importance. The rivers in their lower part are broader. They form stoniness and sandyclay formations from their flows and incomes. We can find clearly these feature of the Vjosa river. In these environments it is located a pioneering vegetation, which is gradually stabilized in natural status and is developed along the river bed and its surroundings up to forest vegetation with Populus alba, with Salix sp. div., with Alnus glutinosa, and with Ulmus minor when anthropogen and zoogen factors don't action. Today this vegetation has brush-grass shape because of cut and damages and it has often the shape of simple grass lands (oligocoenosis) like those of Tamarix parviflora, of Vitex agnus - castus, of Platanus orientalis, of Phragmites australis and of Typha.

>From the hygro and hygrohidrophyle vegetation we separate the plant communities with Lemma sp. div. with Nymphaea alba-lutea, with Potamogeton sp. div., with Myriophyllum spicatum, with Sparganium erectum, with Scirpus lacustris, with Carex elata and with Saccarum ravenae

Vegetation of Mediterranean Pine species. The Pishe-Poro forest represents it. It has the characteristic of a real Mediterranean forest with all the components and scaled structure. The dominant type is the wild pine, Pinnus halepense that creates a plant community with Erica manipuliflora and with Myrtus communis. In the south part it is cultivated with soft pine, Pinus pinea, which creates a very beautiful and healthy forest.

This type of vegetation belongs to the Lower Coast (Adriatic sea). Only the Butrinti zone represents the Upper Coast part (Ionian sea).

For the upper Coast the most characteristics plant communities are:

The vegetation of dry stony pastures, which occupy great surfaces mainly from Vlora to Saranda districts. We can mention: the plant community with Phlomis fruticosa, with broad extension in dry calcareous and flysh, with Salvia officinalis, in calcareous karst, with Cistus incanus in flysh eroded areas, with Hyparrhemia hirta in shallow lands and stones that comes out the surface, with Urginea maritima in stoniness and karst areas, which are characteristics of the region of Saranda.

Grass vegetation of uncultivated lands, which occupy small surfaces, placed mainly in alluvial lands in hillsides and valleys. There are the plant communities with Asphodelus aestivus, with Dittrichia viscosa and with Pteridium aquilium.

Meditterannean evergreen shrub (maquis). There are the plant communities of Quercus coccifera, that are represented garrigue shape, mainly with broad extension along the coast in the region of Delvina and Dukat-Karaburun, with Arbutus unedo, the most spreader brushes in Albania, with Querces ilex. in small surfaces, with Pistacia lentiscus, that has the usual interrupted spread.

Mediterranean decidous brushes. There are the plant communities with Paliurus spina-christi (shibliak shape) with broad extension, but with interruption and degraded, with Pistacia terebinthus with rare distribution, mainly in the region of Delvina up to Fterra, with Rhys coriaria, which has extension up to the north part of Albania, with Carpinus orientalis with broad extension but degraded.

Brushes of phrygana. There are the plant communities with Astragalus sp. div. in calcareous karst and flysh regions, with Spartium junceum along the Himara-Saranda coast, with Quercus macrolepis very rare and degraded from the cut and burn, with Anthylis hermanniae, that is characteristic with usual distribution along the Ionian mainly in the flysh hills of Delvina and Rrezoma.

Vegetation of mountain Mediterranean forest. We can mention the plant communities with Pinus nigra in Llogara, which make this area one of the most beautiful ones.

Vegetation of the upper river and stream beds. This type of vegetation occupies small and fragmented surfaces and it is of great interest for its flora and structure. Here we can find the plant communities with Alnus glutunosa, with Ulmus sp. div and other grass communities.

The vegetation has still great values, nevertheless it is very damaged. The main task is the protection and regeneration of the habitats, plant associations and flora. Among the risked plant associations we can mention:

Tamarici-Salicetum purpurea /V/ along the river beds.
Juncus maritimus-acutus /V/ along the coast in salty wetlands.
Myriophyllo-Nupharetum /E/ fresh water lands.
Nerio-Platanetum orientale /E/ in mouth of streams and gravely lands, Himara-Borsh.
Nerio-Salicetum purpurea /E/ in mouth of streams and gravely lands, Himara-Borsh.
Limonietum vulgar /V/ salinity and wetlands.
Ammophilia arenaria-Medicago marina /V/ sandy coast dunes.
Atriplicetum hastari-tatarici /V/ psammonitrotrophyle, along coast.
Populetum albae /V/ river beds and wet allusions.
Ephedretum dystachyae /E/ in the sands of Vlora.
Buxo-Pinetum nigrae /V/ Llogara.
Crithmo-Limonietum anfracti /R/ in rock coast, Himara.

There is a rich interest with economical and scientific values flora along the coast. We can find here a lot of rare, endemic and relict plants of special interests. They are like a bridge of albanian flora with Mediterranean flora.

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Among the rare, endemic and relict plants with aesthetic and tourism values and at the same time the most risked ones are:
Leucojum valentinum Pau. ssp vlorense Paparisto et Qosja /E/ endemic, in the fissures of calcareous rocks of the coast of Vlora (Kala).
Hypricum haplophylloides Halacsy & Bald /R/ endemic, in calcareous rocks, Llogara.
Taxus baccata L. /E/ relict, in the forest with pine anf fir, Llogara.
Ceratonia siliqua L. /E/ in dry, stony and calcareous habitats: Vlora - Lukova, Sazan.
Nerium oleader L. /E/ Himara, Borsh, in mouth of streams and gravely lands.
Ephedra distachya L. /V/ in the sands of Vlora.
Orchis albanica Goelz & reinhard /E/ endemic, in coast sands of Vlora.
Marsilea quqdrifolia L. /E/ relict, in wetlands.
Other risked species are medical plants, which are highly decreased last times like:
Sideritis syriaca, Colchicum autumnale, different species of the Orchiadaceae family, etc.
We can add some other rare and very beautiful plants where the plant, the flower, the color and the aroma itself: Helichrysum plicatum, Paeonia mascula, Narcisus poeticus, Tulipa sylvestris, Nymphaea alba, Nuphar lutea, Nymphoides peltata, Salvia triloba, Euphorbia dentroides, various kinds of Orchis, Crocus, Scillia, etc. So we can state that the vegetation plays the key role in the beauty of the albanian Riviera. The same can be the state for the landscape along the roads, which play an important role in the tourism.
Natural resources and their management
The Ionian coast and the bay of Vlora have numerous geoenvironmental resources, high biodiversity on water resources. It is a climate oasis for Albania, which promises qualitative and sustainable development of the region through a fragmented and contrasted relief with clean sea, numerous bays and beaches. We have to mention the fact that there is no real winter, because there is no interruption of the vegetation at all. The average annual temperatures range from 16.5 °C (in Vlorλ) to 17 °C (in Sarandλ). The average temperatures of January (which is the coldest month of the year) are more than 9 °C. The average temperatures of the July and August are 24°C and the amplitude of temperatures (14 °C) is the lowest in Albania. The minimum temperatures are rarely under the 0 °C and have a small duration (3-5 days). The maximum temperatures have been 39-40 °C. here is registered the highest number of hours with sun lights (approximately 2770 hours/year) in Albania. The annual and seasonal precipitation rhythm is Mediterranean one.
The coast area is under an extensive construction in its biggest part with carbonic formations. It is poor in superficial water flows, but rich in underground resources. There are powerful resources, mainly undersea resources (in Uji i Ftohtλ, in Borsh, etc.), which guarantee a qualitative and rational tourism. Here can be developed different kind of tourism like balnear and medical, cultural, sport, business, family and specific tourism, but the first priority has the ecological tourism, which respects the environment, flora and fauna.

CONCLUSION

1. The coastal area in the south of Vjosa represents a unique coastal ecosystem in Albania with a rich landscape and scientific, didactic, tourism and economic values.
2. The geomorphologic features of the area are under frequent changes in both vertical and horizontal direction connected with lithostructural factors and with tectonic style and the dynamic of the sea.
3. All the area is dominated by a dry Mediterranean karst landscape, so the impacts in the relief have to consider the specific of its natural evolution. Coastal specific ecosystems has to be free and protected by every kind of intervention, because their damage destroy the ecological equilibrium of the region.
4. The coast area in south of Vjosa has a variety of habitats, which is expressed with the rich flora and various vegetation starting from the vegetation of psammo- and psammonitrophyle dunes, halo- and halohygrophyle vegetation, uncultivated lands vegetation, Mediterranean pines, dry stoniness pastures, mountains Mediterranean forest, upper river and stream beds vegetation etc. Special importance represent some specific plant associations and the endemic, relicts, rare or endangered plants.
5. From the geobotanical viewpoint it belongs to evergreen hard-laved Mediterranean coasts zone, mainly Quercion ilicis Aegean - Ionian subzone of the medium and north Mediterranean anf Orno -

Quercetum ilicis Adriatic subzone. It has also features of Oleo - Ceratonion south Mediterranean zone starting from Karaburun and along the Ionian coast.

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