

The Study of Floristic Diversity in the Lake Ohrid Ecosystem

HYSEN MANKOLLI¹, NATALIJA ACESKA², SVETLANA PETROVSKA³

^{1*} Department of Agro-Environment and Ecology, Agricultural University of Tirana, Albania

^{2*} Executive director NGO Knowledge harvest, Prilep, Macedonia

^{3*} Executive director NGO CeProSARD, Scopje, Macedonia

^{1*} E-mail: h_mankolli@yahoo.com;

Abstract

The ecosystem of Ohrid Lake is one of the most important areas in Albania and Macedonia because of the variety of diversity, floristic diversity and variations of cultivating plants. Many spaces of Ohrid ecosystem have a national and international protection. The study: "The study of floristic diversity on the Lake Ohrid ecosystem" realized in the two points of study Tushemisht and St Naum realized on 2007 year. In the Albanian and Macedonian part of the Lake were found one after the other, six areas of vegetation: a. the area of *Chara* spp., b. the area of *Potamogeton* spp., c. the area of *Phragmites australis* or the group of reeds, d. the area where prevail floaty kinds of leaves, e. marsh areas f. the area of woods (up to 1000 m). In many places the highest density is noticed in the classes *Phragmitetea* (close to the waterside) and *Charetea* (from 5-20 m of depth). In the Albanian and Macedonian part of the lake, is developed the part of reeds. The founding of a monitoring system for taking the measures, in order to notice the changes in vegetation. Preservation of the equilibrium between the natural ecosystem and the agroecosystem. Based on the height of the area, they may be divided in: oak forest termofil with wide leaves, where the oak prevails, and *Quercus frainetto*, associated regularly with *Acer inonspessulanum*, *A. platanoides*, *Fraxinus ornus* in the lowest and warmest parts of oak forests. Forests with oaks that endure the cold, such as *Quercus petraea* and *Q. cerris*, associated by *Sorbus torminalis*, *Acer obtusatum*, *Fraxinus excelsior*, encountered in the middle and upper part of the oak forests. Formations of the forests with beech leaves that fall encountered in the upper part of the forest, a prevailing species is *Fagus sylvatica* associated by *Carpinus betulus*, *Acer obtusatum*, *A. pseudoplatanus*, *Daphne mezereum*, *Tilia cordata* the *Sorbus aria*, *Populus alba*, *Salix alba*, *Ficus* spp. etc. a species with a special interest is chestnut, *Castanea sativa*, with woods that grow in the park and in the hills close to Pogradec. Near the hills of Tushemisht and mountain beam, is found an endemic plant *Alyssum markgraji* (LINNAEUS, 1758).

Key words: vegetation, lake, mountain, ecosystem

INTRODUCTION

Albania is a Mediterranean country on the Balkan Peninsula in the south of Europe. The climate of Albania is diverse. It has four major climatic zones and more sub-zones, which contribute to the country's rich biological diversity. The lake of Pogradec or Ohrid, is characterized by the qualities of a small ecosystem, with water nature which is located in the north east of Albania. Ohrid lake is located in a height of 695 m and is surrounded by mountains that exceed 2000 m; it has a long waterside 87.5 km and a surface of about 358 km². The average depth of the lake is 167 m, while the maximal depth reaches 289 m. about two thirds of the lake are in Macedonia and one third in Albania (MANKOLLI H,2007).The study was realized during the period 2006-2007 along the area of Tushemisht, area with a similarity of biodiversity and in the area of St Naum in the administrative part of Macedonia. Biological diversity - or biodiversity - is one of the key terms in conservation, encompassing the richness of life and the diverse patterns it forms. The Convention on Biological Diversity (CBD) defines biological diversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (Natura 2000, 2007). Biodiversity is the variation of life on the earth. It is an interaction between all the living creatures and their environment. The biodiversity is composed by: ecological diversity (biomass, bioregion, landschaft, ecosystem, habitat, and not intermixed areas), diversity of species (class, type, family, gender, kind, sub kind); genetic diversity: (population, individual, chromosomes, genes, and nucleotide). Traditional rural areas often have high values of biodiversity, containing different kinds of fruits, different plants grown in mix systems, ornamental plants and those used in the fences etc. However the biodiversity is in a danger situation for as long as the level of use exceeds the level of the regeneration capacity (Nature, Landscape and Biodiversity Conservation in Albania 1997). The Convention of Rios formulated the achievable objectives: such as the preservation of the biological diversity, the stable use of its components and indifference in the separation of profits as a result of the exploitation of genetic potentials. The ecosystem of Ohrid Lake is one of the most important areas in Albania because of the variety of diversity, floristic diversity and variations of cultivating plants. Many spaces of Ohri ecosystem have a national and international protection (HODO,P. & DINGA L.2000)



Fig.1. Map of study Lake Ohrid Ecosystem

MATERIAL AND METHODS

The methodology used is based on: Observation Method, key method for the determination of flora, and the comparative method (Istituto Per L'Oltre Mare, 2002). The classical method of research work in the ground is used based on the size of parcels along the lake area. The size of the measured parcel has been determined through the method of "minimum surface", while the placement of the tract is identified along the segment based on the method "Marshrut" (where each of these indicates the changes in vegetation). In these tracts, have been analyzed two different levels of biodiversity: a) Ecological diversity (ecosystems, plant associations, habitats, landscapes and b) dominant types and families. The analysis includes the identification of the biological specter based on the biological elements (categorization of Raunkier) and chorological elements that belong to the origin of species. In this way any negative development (degradation) or positive development (rehabilitation) will be obvious, and if necessary, will be drafted the measures forest . The denomination of plant associations and their taxonomic groups is done based on the principles of taxone of Lineu, two nominative (LINNAEUS, 1758). The ecotonic classification of the ecosystem of Ohrid was carried out after the floristic evidence in the edafike area close to the waterside of the lake and up to a distance of 500-1000 m from the waterside, area which belongs to the ecoton of the ecosystem of Ohrid, in the area of Tushemisht and St. Naum. Flora. Based on their structure, physiognomy (there is not such terminology) and places where they grow, the plants: wood trees renes leaves composed by *Carpinus orientalis* and *Ostrya carpinlja*, *Quercus pubescens* and *Acer campestre*. Permanent greenness woods grown in small heights near the Drilon, along the waterside of the lake in Tushemisht and St. Naum. Permanent greenness woods of the trees, Macedonian juniper-hornbeam-oak, composed by *Juniperus oetictissima*, *Carpinus orientalis*, *Quercus trojana* with a regular association of *Buxus sempervirens*, *Ostrya carpinjfolia*, *Prunus spinosa*, *Juniperus oxycedrus* (HODO & DINGA, 2000). Formations of bushes and grassy vegetation. Are represented by the low wood vegetation (0.5 m), with the types of prevailing low bushes of juniper *Juniperus communis* subsp. *nana*, *Vaccinium myrtillus* the *Chamoecytisus polytrichus*. Among the bushes are grown greens stable from the cold, such as *Calamagrostis varia* and *Potentilla erecta*. Vegetation in a distance of 1000 m from the waterside of the lake. They are rare in the spaces of Drilon and St. Naun, characterized by the plants *Alchemilla alpina*, *Achillea airata* and greens *Festuca* spp., *Stipa pulcherrima*, *Nardus stricta*, *Anthoxanthum odoratun*. In the rocky areas are found the species *Sagina saginoides*, *Geranium subcauescens* and *Viola gradis*. In the meadows of biotops with humidity, where water sources flow, is developed a vegetation with a high degree of greenness with main components the species: *Cirsium paustre*, *Cardamine rapanfolia*, *Veratrum album*, *Adenostyes alliariae* and *Epilobium montanum*. Rare vegetation in the rocky parts of the area of Tushemisht and St Naumi is evaluated for:

- *Primula vulgaris*, *Urtica diotica*
- *Teucrium chamaedrys*, *Matricaria chamomilla*
- *Hypericum pet-formalism*, *Papaver rhoeas*
- *Achillea millefolium*, *Rubus ulmfblins*
- *Melissa officinalis*, *Viola odorata*

- *Genriana mica*, *Rubus ideaus*
 - *Sideritis roeseri*, *Malva sylvestris*
 - *Juniperus oxycedrus*, *Mentha aquatica*
 - *Juniperus communis*, *Crataegus monogyna*
 - *Valeriana officinalis*, *Origanum vulgore*
 - *Salvia offleinalis*, *Thymus serpyllium*
 - *Vat-alt-urn album*, *Agrirnonia eupatoria*
 - *Sambucus nigra*, *Arctium lappa*
 - *Trfo1ium alpestre*, *Atropa bellodona*
 - *Rosa canina*, *Ceterach officinarum*
 - *Tussilago farfara*, *Dryopteris filix-mas*
 - *Satureja montana*, *Colchicum autumnale*
- (The names based on LINNAEUS, 1758).

RESULTS AND DISCUSSIONS

The ecotonic classification of the ecosystem of Ohrid was carried out after the floristic evidence in the edafike area close to the waterside of the lake and up to a distance of 500-1000 m from the waterside, area which belongs to the ecoton of the ecosystem of Ohrid, in the area of Tushemisht and St. Naum. Stocktaking and distribution of big water plants, or macrofitcs, in the area of the waterside of the lake is difficult, but based on the previous studies and consultation with experts, was realized an evaluation of the biodiversity of the area of the lake waterside. Monitoring points were taken from St Naum and Tushemisht. The sections of observations were placed on the earth, in the waterside and in the depth of the area of waterside, in order to characterize the biological diversity and the general features of growth. The results show a relatively rich vegetation and fore. Up to now in the studied area have been identified more types of vascular plants (with vessels) of the earth water. The majority of them belong to the hydrophilic and hydrophilic types of plants. The most common species are *Phragmites australis*, *Potamogeton* ssp., *Charts* spp., *Ceratophvllum* spp., *Myriophyllum* spp. The analysis of flora indicates clearly that the ecotonic area of the ecosystem in the two points of study Tushemisht and St Naun is rich in species and habitats. Based on the results of analysis and on the objectives of the national park, may be given the following recommendations for the arrangement of vegetation: in-situ protection of the most threatened species: *Ramonda serbica*, *Taxus baccata*, *Satureja montana*, *Pinus leucodermis*, etc .the rehabilitated of degraded areas through the natural renovation, surroundings (graze-zero), reforest, reduce of the penetration of house animals and the insertion of silvo-pastoral systems. The founding of a monitoring system for taking the measures, in order to evidence changes in vegetation. The rod group *Phragmites communis*, which is an important part of the floristic vegetation of Laguna. They serve as habitat for a great number of the species of fishes and waterfowls .the rod area along the Macedonian waterside (Radozda - St Naum), close to Tushemisht had a general length of 14,833 m and a surface of 74.35 ha. Because of the cutting and burning of rods, this area has been considerably reduced. The links with the canals of the waterside and of the marsh are interrupted. Even the area of Drilon in the east has the presence of the group of rods . some kinds of plants, especially

with floaty leaves *Nuphar luteum* and *Polygonum amphibium*, which previously were present in many places of the waterside or marsh of Ohrid, now they are rare and threatened to disappear. In the mean time new associations are spreading , mainly the underwater plants *Vallisneria spiralis*, *Potamogeton lucens*, *P. crispus*, which grow with a high intensity in some places. The evaluation of biodiversity in a territory requires also the study of several indicators that relate to the used flora and fauna. The part of the habitat which is used for agricultural purposes makes up an agro ecosystem. Some indicators that relate to the biological diversity and its protection are: the surface used for agricultural purposes, the number of the species of the cultivated vegetation, the number of the species of the animals of production, etc. from 2600 ha of cultivated land in the Albanian part of the water collection pond, about 1800 acres are located among Tushemishti and Pogradec. The cultivable lands extend up to about 400-1000 m of distance from the waterside of the lake. From the study carried out in the area of Tushemisht, and close to the National Park of Drilon was noticed the presence of many species of cultivated vegetation in farms. A characteristic of this is the presence of vegetables, fruit trees, vineyards and ecotypes of the area. Based on the result and discus of the study in the two points of study Tushemisht and St Naum we show: Ohrid Lake is one of the oldest lakes in the world. It is located in geographical borders between Albania and Macedonia. Ohrid Lake has a huge biological diversity. Floristic indicators are the indicators of the efficiency of the use of energy in the ecosystem. The study is based on quantitative and qualitative evaluation, based on the method of lot and numeration during the period 2006-2007 in the ecotonic area of Ohrid lake ecosystem . The study gives the possibility of a complete specification of the general view of Ohrid Lake ecosystem. The living creatures that live in the lake are the best indicators of the speed of eutrofication and of the general condition of soundness in the lake ecosystem. The environment has been evaluated by the presence of biodiversity in several areas such as: (1) the area of Charts spp., (2) the area of *Potamogeton* spp., (3) the area of *Phragmites australis* or the canebrake area, (4) the area where prevail types of floaty leafs, (5) marshy area and (6) woods area. In many places the highest density has been noticed in the classes of Phragmitetea (close to the waterside) and Charetea (from 5 - 20 m of depth). The acknowledgement of ecotonic area gives chances for the evolutionary evaluation of floristic types and condition of habitats. Near the hills of Tushemisht and mountain beam, is found an endemic plant *Alyssum markgraji*.

Tab. 1.Vegetations in Tushemishtit and Shen Naum (2007-2008)

Latin Name	Latin Name
<i>Quercus sp.</i>	<i>Clematis flamula, C. vitalba</i>
<i>Quercus cerris</i>	<i>Origanum vulgare</i>
<i>Carpinus orientalis</i>	<i>Equisetum arvense</i>
<i>Fraxinus excelsior</i>	<i>Juncus maritima</i>
<i>Corylus avellana</i>	<i>Tusylago farfara</i>
<i>Malus silvestris</i>	<i>Dactylis glomerata</i>
<i>Quercus robur</i>	<i>Festuca pratensis</i>
<i>Prunus spinosa</i>	<i>Lolium perene, L. multiflora</i>
<i>Prunus cerasifera</i>	<i>Lilium spp.</i>
<i>Ficus carica</i>	<i>Gladiolus spp.</i>
<i>Sorbus acuparia</i>	<i>Viola odorata, V. silvestris</i>

<i>Platanus orientalis</i>	<i>Viola</i> spp.
<i>Ulmus foliacea</i>	<i>Bellis</i> spp.
<i>Populus nigra</i>	<i>Helleborus odorus</i>
<i>Pinus silvestris</i>	<i>Cynodon dactylon</i>
<i>Pinus nigra</i>	<i>Raphanus raphanistrum</i>
<i>Carpinus orientalis</i>	<i>Ranunculus arvensis</i>
<i>Cornus mas</i>	<i>Urtica dioica</i>
<i>Crataegus monogyna</i>	<i>Pteridium aquilinus</i>
<i>Rosa canina</i>	<i>Funaria hyprometrica</i>
<i>Rubus ulmifolius</i>	Licken
<i>Vitis sylvestris</i>	Fungi
<i>Hedera helix</i>	<i>Medicago</i> spp.

Sources: Investigated area 2007-2008, LINNAEUS, 1758.

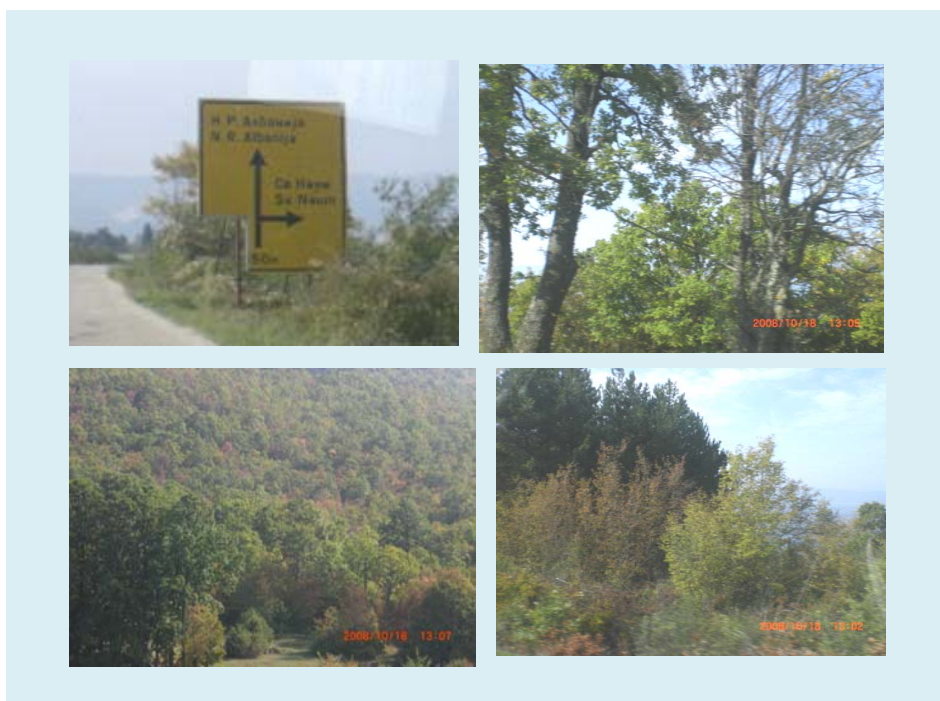


Fig. 2. The photo's of area Sv. Naum, Lake Ohrid, Macedonia

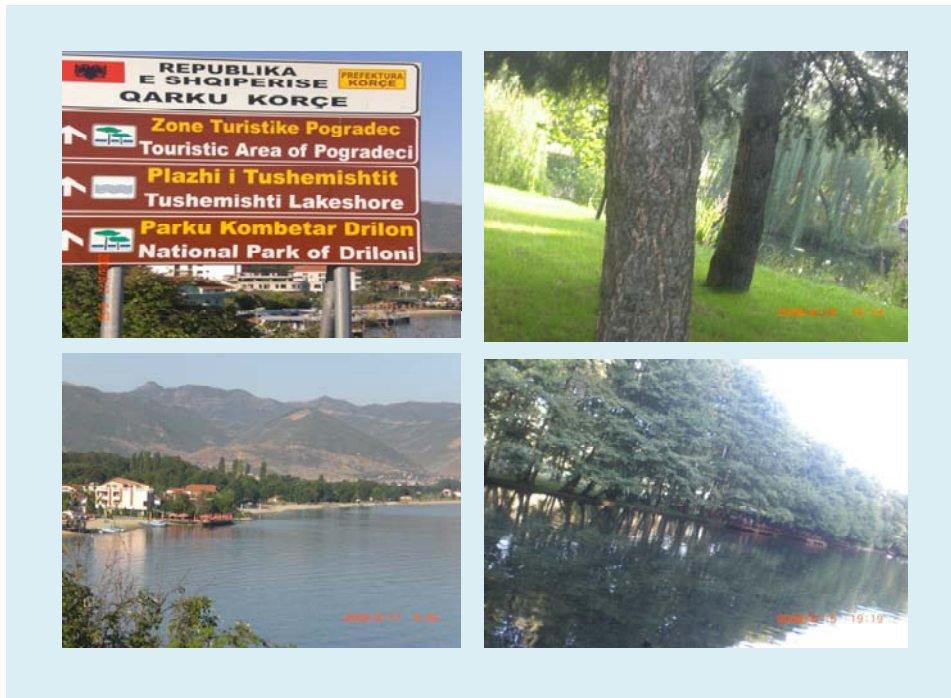


Fig. 3. The photo's area Drilon, Pogradec, Lake Ohrid, Albania

CONCLUSIONS

The ecosystem of Ohrid Lake is one of the most important areas in Albania because of the variety of diversity, floristic diversity and variations of cultivating plants. Many spaces of Ohri ecosystem have a national and international protection. From the data, results and their discuss we have conclusions below:

- The vegetation, the area ecology Lake of Ohrid have particular important and there are plant diversity, nature vegetation and plant cultivations, plant herbs and trees.
- The unit area Albanian the biodiversity has small index, that for used of area construction around Lake Ohri.
- The unit area Macedonia the biodiversity has high index that for used area with standard environmental.
- One particular aspect is plant of cultivation near of the area lake, which is biology rich.
- In some habitats of Lake Ecosystem of Ohri have added plant of water, this show more eutrofication with organic mater.
- The ecosystem of Ohri is in the same at biodiversity and condition study Albanian - Macedonia on the future.
- For a sonstenible biodiversity will look for action in quality urban environment, in arrowed area of Lake Ohrid on part's Albania and Macedonia.

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