ISSN 2073-2244
www.alb-shkenca.org

AKTET
Journal of Institute Alb-Shkenca
Revistë Shkencore e Institutit Alb-Shkenca

BIODIVERSITY EVALUATION OF DAJTI NATIONAL PARK

ALKEDA KALAJNXHIU*[1], ARSEN PROKO[2], PETRIT HODA[3]
[1]Agricultural University of Tirana, Faculty of Agriculture and Environment
[2]Albanian Academy of Sciences
[3]University of Tirana, Faculty of Natural Sciences
Email: ketila2000@yahoo.com

SUMMARY

Dajti National Park (DNP) is one of the most important protected areas, in the country due to its complexity. The sustainable management of DNP area calls for expansion of land use planning including specific functions as biodiversity conservation. Among the research, work in the field of inventory and evaluation of biodiversity, will be prevailing. Series of important factors assigned to biodiversity as function of ecosystem and inventory determine the degree, in which the function is presented and of the ecosystem's ability to fulfill the given function. Comparison of the above mentioned factors permits the assessment of the condition in a certain area with respect to the function. The implementation of a methodology for the biodiversity evaluation (actual and potential values), using a mathematical approach and based on the suitability and relative weight of the factors is provided in this study. Turboveg, Juice, Syntax and GIS programs are used for statistical analyses and spatial biodiversity planning in the specific status ecosystems of DNP. The plant associations Braun Blanquet sensu strictu is defined as the management unit.

Key words: Actual and Potential Biodiversity, Sustainable use, Cluster analyze, GIS

INTRODUCTION

Biodiversity conservation in the context of sustainable management of the national parks is becoming a priority of regional policies (SZHSPK 2004). On the national level, this originates from the Strategy of the Biodiversity and Action Plan (SBDPV 2000), on regional level from Pan-European Strategy for the Biological and Landscapes Diversity (PESBLD 1994), while on global level from Convention of Biological Diversity (CDB 1992).

According to CDB, the three global objectives for the conservation of the biodiversity are:

1.Conservation and rehabilitation of biological and landscape biodiversity.
2.Sustainable use of natural resources.
3.Faire and equitable sharing of all benefits arising out from the utilisation of genetic sources.

The objective of the study is to establish an innovative methodology for the assessment of the biodiversity level encompassing as much as possible factors while considering vegetation type as the unit of spatial planning.

STUDY AREA

Dajti National Park (DNP) is one of the most important national parks on the country considering its complexity. The studied area of DNP is 293.8 km^2 and its elevation range is from 445m to 1613m encompassing three phyto-climatic belts. The climate variability contributes to the ecological biodiversity. Geological and soil variability are other factors which strengthen the distinguish range of the biodiversity in this area. (Fig 1)

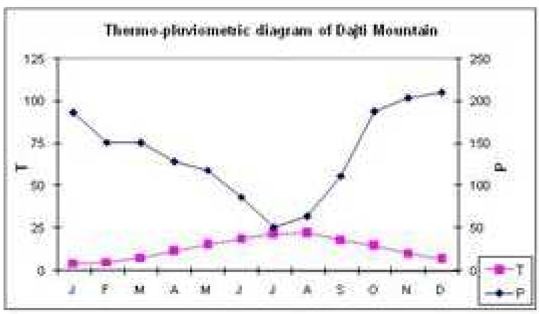

Fig. 1 Climate indicators diagram (Gaussen) (TMS)

MATERIAL AND METHODS

Several factors affecting biodiversity denote a complexity of variables, which should be included in the inventory system. Overlapping and interrelating contributing factors is difficult because of different sort and measurement units. To overcome this, hierarchical systematic classification of the factors is performed. Classification reveals the interrelations among factors and the structure through which the factor affect the biodiversity.

A classification of these factors, according to the system analysis, has revealed two target systems, namely the external and internal factors. (Gatzojanis et al 2001).

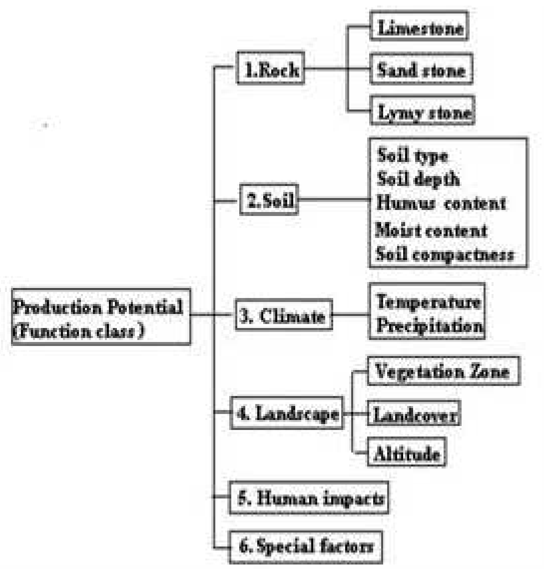

Fig.2. External factors

The external factors (Fig.2) include all those factors that concern the surrounding environment of the area. These factors extend their influence on a large area and create a given situation that remains unchanged at the time scale of natural ecosystem management.

The internal factors (Fig.3) are related to the ecosystem structure and subject to major changes due to ecosystem development, species succession and management practices. Internal factors determine the suitability class of an ecosystem with respect to biodiversity. Suitability class is a measure of the performance of current ecosystem conditions regarding biodiversity. That is how well (or bad) an ecosystem fulfills the function of biodiversity. In addition, the biodiversity factors related to specific biodiversity (species and family richness, biological and chorological spectrum, endemic and endangerment status) are included here. Ecological biodiversity (naturalness, originality, rarity, representativeness, aesthetic value, and Shannon index), are also included according to associations.

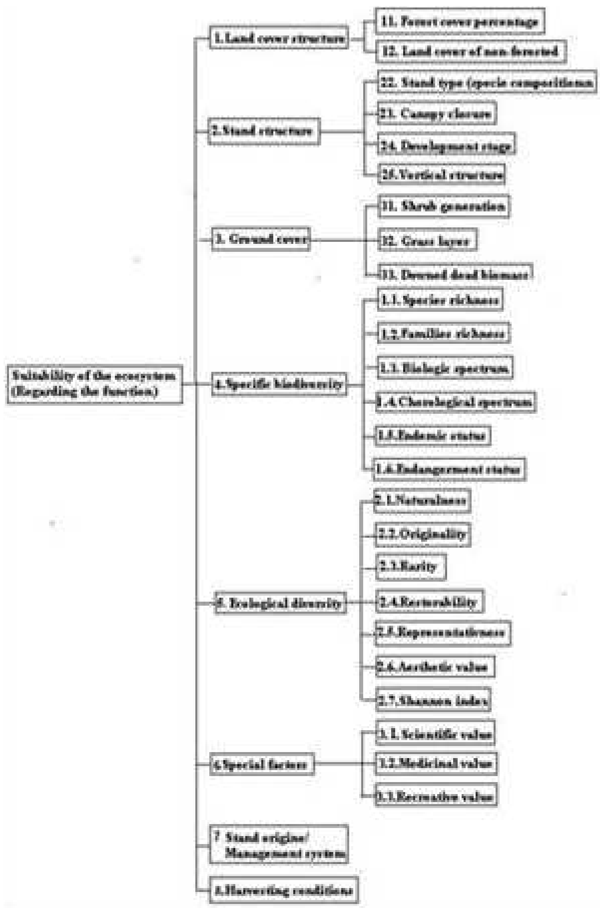

Fig.3. Internal factors

Assessment of these factors determines the function class. Function class is an expression of the level at which a function operates or is present in the area. The discrimination of factors into external and internal ones leads to the evaluation of different aspects of the biodiversity as a function of the ecosystem. The external factors determine the "potentiality" of the ecosystem in respect to a function, while the internal ones determine the "suitability" of the ecosystem with respect to the function.

Regardless where the system belongs, each factor is determined by two features: its quality and its importance (relative weight). Assessment of the quality and importance of external factors in the potential function, along with the estimation of the quality and weight of the internal factors in ecosystem's suitability, provide the overall classification of the vegetation conditions with respect to a function.

Based on the quality (qi) and the relative weight (gi) of the lower level factor; the quality of an upper level factor can be estimated by the function.

$$\mathbf{N} = \sum (\mathbf{qi} \cdot \mathbf{gi})$$

Depending on the value of y = N = Σ(qi.gi), a function can then be ranked into four classes. (Tab.1).

Q	N	Level of the biodiversity
4	351– 400	Very high
3	251– 350	High
2	151- 250	Low
1	100– 150	Very low

Tab. 1 External/internal/biodiversity factor-function class

Plant associations (Braun Blanquet, 1936) are identified by multivariable analyze, using Juice (Tichy 2001) and Syntax 2000 (Podani, 1994) softwares and are used as management unit.

RESULTS

Based on the data collected from the floristic inventory, the species richness of DNP is about 940 vascular plants or 29% of Albanian flora. (Kalajnxhiu, 2006) Ecological diversity seems to be high too; identified vegetation types of DNP composed by 13 plant associations (Braun Blanquet 1936) and 2 plants communities are shown on the syn-taxonomy table (Tab.2). The calculations processes for the estimation of biodiversity on the level of vegetation type, through an example (*Quercetum frainetto-cerris*), and then on a comprehensive table are presented.

Although the classification of the factors is based on the means – to - objective relationships, possible interdependencies among the factors are examined during the evaluation procedure to avoid double evaluation. The codification of the external and internal factors and the values of the interval scale are presented in Tables 3 and 4. The possible values of each factor are classified into 4 categories and a quality of 1, 2, 3, and 4 is assigned to each category.

Cl.: Quercetea ilicis Br-Bl 36.

Or.: Quercetalia ilicis Br.-Bl. 32

All.: Quercion ilicis Br.-Bl. 38

Ass. 1: Arbuto-Quercetum ilicis Br.-Bl. 36

Cl.: Queco-Fagetea Br.-Bl. et Vlieger 37

Or.: Quercetalia pubescentis Br.- Bl.31

All.: Ostryo –Carpinion orientalis Br. –Bl. 32

Ass.2: Quercetum – Ostrya carpinifolia Horvat 38

Ass.3: Fraxino –Carpinetum orientalis

All.: Quercion frainetto-cerris (Horv 1939).

Ass. 4: Quercetum frainetto-cerris Oberd.48 et Horvat 59

Or.: Quercetalia robori-petraeae Tx. 31

All.: Quercion robori- petraeae Br.-Bl. 32

Ass.5: Querco-Castanetum submediterraneum Wraber 54

Or.: Prunetalia spinosae Tx. 52

All.: Prunion spinosae Fab. et Fukarek 68

Ass.6: Pruno-Juniperetum Fab. et Fuk. 68

Or. : Fagetalia sylvaticae Pawlovski 28.

All.: Fagion sylvaticae Horvat 38

Ass. 7: Galio odorati-Fagetum Sougnez et Thill. 59

All.: Fagion illyricum Horvat 38

Ass. 8: Aceri-Fagetum Bartsch 40, Moor 52

All.: Ostryo-Fagion Borhidi 63

Ass. 9: Ostryo-Fagetum Blecic 58

Or.: Populetalia Br.-Bl. 31

All.: Populion albae Br.-Bl. 31

Ass. 10: Juglando-Platanetum orientalis Em. et Dekov 61

Cl.: Erico-Pinetea Horvat 59

Or. : Erico-Pinetalia Horvat 59

All.: Pinion heldreichi Horvat 63

Ass. 11: Fago-Pinetum leucodermis Horvat 50

Cl.: Molinio-Arrhenatheretea Tx. 37

Or.: Arrhenatheretalia Pawl. 28

All.: Cynosurion cristati Tx. 47

Ass. 12: Lolio-Cynosuretum Tx.37

Cl.: Asplenietea rupestria Br.-Bl. 34

Or.: Potentilletalia Br.-Bl. 26

All.: Ramondion nathaliae Horvat 35

Ass. 13: Ceterach-Ramondetum serbicae Jovanovic 52

All.: Micromerion Horvat 31

14: Formations of Moltkia petraeae Griseb.

Cl.: Brachypodio-Chrysopogonetea Horvatic 58

Or.: Scorzonero-Chrysopogonetalia Horvatic et Horvat 58

All.: Chrysopogoni-Saturejon Horvat et Horvatic 34

15: Formations of Satureja montana L.

Tab. 2 Vegetation units Syntaxonomical scheme

This classification is rather empirical and resulted after consultation with the specialists and biodiversity experts. Properly designed experimentation and testing of the methodology would lead to a better refinement of the categories and assignment of a unique quality value.

ci pi ci*pi Ci Pi Ci*Pi
[1]. Rock Sum 100 300 3 8.75 26.25
[1.1] Mother Rock 3 100 300
[2] Soil Sum 100 273.05 2.731 20.25 55.2926
[21] Soil type 2 32.25 64.5
[22] Soil structure 4 18.55 74.2
[23] Soil depth 2 13.25 26.5
[24] Humus content 3 15.15 45.45
[25] Soil moisture 3 12.35 37.05
[26] Soil compactness 3 8.45 25.35
[3] Clime Sum 100 269.45 2.695 33.25 89.5921
[31] Dry period 2 15.35 30.7
[32] Vegetation period 3 45.3 135.9
[33] Average temperature 3 24.15 72.45
[34] Annual precipitation 2 15.2 30.4
[4] Landscape Sum 100 300 3 14.25 42.75
[41] Phyto-climatic zone 3 47.85 143.55
[42] Structure of soil cover 3 27.5 82.5
[43] Altitude 3 24.65 73.95
[5] Land use 2 100 200 2 23.5 47
100 260.885
C = ∑Ci*Pi / 100 =
2.61 = 3

Tab.3 Evaluation of external factors of biodiversity Quercetum frainetto-cerris

Ci pi ci*pi Ci Pi Ci*Pi
[1] Structure of soil cover Sum 100 200 2 11.86 23.72
[11] % of Forest Cover 2 56.5 113
[12] Soil cover in non forest zones 2 43.5 87
[2] Forest structure 100 186.8 1.87 17.65 32.97
[21] Structure type 2 34.7 69.4
[22] Type (species composition) 2 15.56 31.12
[23] Cover closure 2 12.34 24.68
[24] Dynamic stage 2 24.2 48.4
[25] Vertical structure 1 13.2 1 3.2
[3] Surface cover Sum 100 214.5 2.15 13.22 28.36
[31] Shrub /density of regeneration 3 57.25 171.8
[32] Grass cover 1 27.89 2 7.89
[33] Deed biomass 1 14.86 1 4.86
[4] Management Sum 100 300 3 34.73 104.2
[41] Management system 3 100 300
[5] Harvesting conditions Sum 100 200 2 22.54 45.08
[51] Perturbation 2 100 200
[1] Specific Biodiversity Sum 100 210.68 2.107 35.61 75.023
[11] Species Richness 3 45.67 137.01
[12] Family Richness 2 6.89 13.78
[13] Biologic spectrum 2 4.74 9.48
[14] Chorological spectrum 2 7.71 15.42
[15] Endemic status 1 22.43 2 2.43
[16] Endangerment status 1 12.56 1 2.56
[2] Ecologic Diversity Sum 100 204.42 2.044 44.87 91.723
[21] Provenience 2 30.67 61.34
[22] Origin 1 12.03 1 2.03
[23] Rarity 2 17.15 34.3
[24] Regeneration scale 3 3.36 10.08
[25] Representativeness 1 7.53 7.5 3
[26] Esthetical value 2 8.76 17.52
[27 Shannon Index 3 20.54 61.62
[3] Special Factors Sum 100 142.24 1.422 19.52 27.765
[31] Scientific Value 1 25.64 2 5.64
[32] Medicinal plants 2 42.24 84.48
[33] Recreative functions 1 32.12 3 2.12 100 211.51
C = ∑ C I * Pi / 100 = 2.11 = 2

Tab. 4 Evaluation of internal factors per *Quercetum frainetto-cerris*

Associations	External Factors	Internal Factors	Overall Values	Average
Deciduous Termophilous Vegetation				
Corylo-Carpinetum	2.61	2.34	2.42	2
Fraxino-Carpinetum	2.86	2.32	2.5	3
Pruno-Juniperetum	2.03	1.33	1.76	2
Quercetum frainetto-cerris	2.74	3.31	3.12	3
Ostryo-Carpinetum	2.5	2.45	2.46	2
Querco-Castanetum	2.56	2.1	2.33	3

Mesophylous Brodaleaves Vegetation				
Acero-Fagetum	2.61	2.35	2.43	2
Ostryo-Fagetum	2.43	2.57	2.52	3
Galio-Fagetum	2.45	3.15	2.58	3
Fago-Pinetum	2.26	2.45	1.57	2
Sclerophylous Evergreen Vegetation				
Arbuto-Erica	2.95	2.52	2.66	3
Grass Vegetation (pastures)				
Moltkia	2.59	1.69	1.99	2
Ramondetum	2.53	2.51	2.51	2
Satureion	2.31	1.91	2.02	2
Cynosurion	2.7	1.2	2.02	2
Riparian vegetation				
Platanetum	2.26	2.26	2.26	2

Tab. 5 Overall evaluation of the biodiversity

In the way, an average value per external, internal of biodiversity factors and per each vegetation type can be given and we are able to distinguish in a comparative way the biodiversity value per each vegetation type and, as the result, hot spot, worming spot and cold spot identification. (Tab.5)

CONCLUSIONS

The methodology proposed in this case study is an appropriate tool, useful for the evaluation of the biodiversity on other natural ecosystems.

Quercetum frainetto-ceris and *Galio-Fagetum* have higher level biodiversity point of view, as the result of carefull protection, meantime *Lolio-Cynosuretum*, *Pruno-Juniperetum*, *Saturejon* and communities of *Moltkia* have lower one; as the result of human intervention.

Almost in all vegetation types the real biodiversity is lower than potential biodiversity, as the result of human impacts. Consequently, rehabilitation of the vegetation toward climax and sub-climax stages will be the most appropriate in these areas.

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