



**Serbia, Montenegro and Natura 2000: Strengthening the Capacity  
of Governments and Civil Sector to Adapt to EU Nature Protection  
Acquis**

**BASELINE REVIEW**

of available biodiversity data for the preparation of inventory of the Habitats Directive  
92/43/EEC Annex I habitat types and Annex II species in Republic of Montenegro

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# Serbia, Montenegro and Natura 2000: Strengthening the Capacity of Governments and Civil Sector to Adapt to EU Nature Protection Acquis

## 1. Introduction

Development goal of the project “Serbia, Montenegro and Natura 2000: Strengthening the Capacity of Governments and Civil Sector to adapt to EU Nature Protection Acquis” is to build up skills and competencies for authorities and civil sector in Serbia and Montenegro to successfully adapt to EU's legal biodiversity protection standards, as one important step in securing Euro-Atlantic integration.

The objective 1 of the project aims to build up capacities of local institutions in Montenegro responsible for nature conservation – primarily the Institute for Nature Protection in Podgorica and the Ministry of Environment – to enable establishment of Natura 2000 network in Montenegro. In practice this means establishment of a functional system for gathering, storage and evaluation of scientific data on the presence of Habitats Directive 92/43/EEC Annex habitat types and species for Montenegro. The activities include:

- review of baseline situation in available biodiversity data and expertise
- identification of Annex habitat types and species for Montenegro, i.e. development of country Reference lists of HD Annex habitat types and species,
- identification of possible additions to the annexes of the directive from Montenegro,
- preparation of the Interpretation manual of HD Annex I habitat types for Montenegro / Catalogue of Habitats
- development of information system for storage of biodiversity data on habitat types and species
- development of methodologies for gathering of existing data and also for field inventories/mapping of habitat types and species of Community Importance
- gathering of existing data annex habitat types and species from Montenegro
- field mapping of annex habitat types and species in selected parts of Montenegro
- analysis of data and identification of needs for additional field data collection – insufficiently covered habitats, species and areas

The aim of this review is to identify existing data sources and datasets relevant for the planned inventory of the Habitats Directive 92/43/EEC Annex I habitat types and Annex II species present in Republic of Montenegro. The data sources may include databases with biodiversity data, printed scientific publications and articles, hard copy and digital maps, aerial photos and satellite images and various GIS layers. The review makes the first step for further activities within this objective of the project as listed above.

## 2. Identified sources of information

### 2.1 Databases

The only officially existing database with biodiversity data for the territory of Montenegro is the EMERALD database administered by Institute for Nature Protection in Podgorica. The database was created during identification of potential Areas of Special Conservation Interest (ASCIs) making the so called EMERALD network established according to the Convention on the Conservation of European Wildlife and Natural Habitats (Bern 1979). The database version of September 2008 contains information on 32 EMERALD sites for Montenegro, the



## Serbia, Montenegro and Natura 2000: Strengthening the Capacity of Governments and Civil Sector to Adapt to EU Nature Protection Acquis

list of sites in indicated in the following Table 1. The structure of the database is similar to the Natura 2000 database (similar structure to Standard Data Forms of the Natura 2000 database). The database contains data on 61 species listed in the Habitats Directive Annexes. The list of species on which the data is included in the EMERALD database is indicated in Table 2. The database also contains data on habitat types of different hierarchic level important for selection of the EMERALD sites. Due to different habitat classification systems used by EMERALD and those of the Habitats Directive the use of the data on habitat types is limited. In addition some data are missing or the information is incomplete. There is also a GIS layer of borders of the Emerald sites, although very rough and unprecise when compared to the topographic maps of 1:25 000. The database can be however used for pre-identification of possible pilot areas for detailed field mapping of target HD Annex I habitat types and Annex II species.

Table 1: List of EMERALD sites according to database version September 2008

Site Name
Maglic, Volujak i Bioc
Canyon of Mala Rijeka
Durmitor mountain with Tara River Canyon
Skadar Lake
Velika Plaza with Solana Ulcinj
Buljarica
Field Cemovsko polje
Bjelasica
Kanjon Cijevne
Kanjon Mrtvice
Lovcen
Tivatska solila
Sasko jezero, rijeka Bojana, Knete, Ada Bojana
Rumija
Cave in Djalovica Ravine
Plavsko-Gusinjske Prokletije (+Bogicevica)
Lim river
Valley of Cehotina river
Ljubisnja
Golija i Ledenice
Ostatak kanjona Pive ispod Hidroelektrane
Visitor and Zeletin
Komarnica
Kotorsko risanski bay
Sinjavina (Babji zub i Gradiste)
Orjen
Pecin beach
Hajla
Spas, Budva
Komovi
Katici, Donkova and Velja seka islands
Platamuni



## Serbia, Montenegro and Natura 2000: Strengthening the Capacity of Governments and Civil Sector to Adapt to EU Nature Protection Acquis

Table 2: List of Habitats Directive Annex species included in the EMERALD database version September 2008

Group	SPECNAME
amprep	Bombina variegata
amprep	Caretta caretta
amprep	Chelonia mydas
amprep	Elaphe longissima
amprep	Elaphe quatuorlineata
amprep	Elaphe situla
amprep	Emys orbicularis
amprep	Mauremys caspica
amprep	Salamandra salamandra aurorae
amprep	Testudo hermanni
amprep	Triturus carnifex
amprep	Vipera ursinii
fish	Acipenser naccarii
fish	Acipenser sturio
fish	Alburnus albidus
fish	Alosa fallax
fish	Barbus meridionalis
fish	Cobitis taenia
fish	Cottus gobio
fish	Eudontomyzon spp.
fish	Hucho hucho
fish	Lampetra fluviatilis
fish	Lampetra planeri
fish	Leuciscus souffia
fish	Padogobius panizzae
fish	Petromyzon marinus
fish	Phoxinellus spp.
fish	Rhodeus sericeus amarus
fish	Rutilus rubilio
fish	Salmo marmoratus
invert	Buprestis splendens
invert	Callimorpha quadripunctaria
invert	Cerambyx cerdo
invert	Eriogaster catax
invert	Lucanus cervus
invert	Lycaena dispar
invert	Osmoderma eremita
invert	Stephanopachys substriatus
mammal	Canis lupus
mammal	Lutra lutra
mammal	Lynx lynx
mammal	Miniopterus schreibersi
mammal	Myotis bechsteini
mammal	Myotis blythii
mammal	Myotis capaccinii
mammal	Myotis emarginatus
mammal	Myotis myotis
mammal	Phocoena phocoena



## Serbia, Montenegro and Natura 2000: Strengthening the Capacity of Governments and Civil Sector to Adapt to EU Nature Protection Acquis

mammal	Rhinolophus blasii
mammal	Rhinolophus euryale
mammal	Rhinolophus ferrumequinum
mammal	Rhinolophus hipposideros
mammal	Rupicapra rupicapra
mammal	Rupicapra rupicapra balcanica
mammal	Tursiops truncatus
mammal	Ursus arctos
plant	Androsace mathildae
plant	Cypripedium calceolus
plant	Eryngium alpinum
plant	Marsilea quadrifolia

### 2.2 Maps, aerial photos, satellite images and GIS layers

The topographical information in digitalised form such as digital geo-referenced maps (images), aerial photos or satellite images, GIS layers of different types, etc. are of crucial importance for the gathering of existing data and for the field mapping. Availability of such datasets directly determines efficiency of the data gathering process (time and capacity efficiency). The most important source of digital topographic data for Montenegro is the regional UNDP office in Podgorica. The datasets available from the UNDP office are summarized in Table 3.

*Table 3: List of relevant digital datasets available for Montenegro*

<b>Raster georeferenced maps</b>			
<b>Subject</b>	<b>Scale</b>	<b>Administrator</b>	<b>Comment</b>
General topographical map	1:25 000	UNDP	useful maps for field mapping and also for digitalisation of existing analogue data on target habitats and species
General topographical map	1:200 000	UNDP	
Hydrology	1:50 000	UNDP	
Pedology	1:50 000	UNDP	
<b>Vector georeferenced maps/ GIS layers</b>			
<b>Subject</b>	<b>File type</b>	<b>Administrator</b>	<b>Comment</b>
Country border	SHAPE	UNDP	useful for field mapping
Country border	MAP	UNDP	
Shoreline	SHAPE	UNDP	useful for field mapping
Shoreline	MAP	UNDP	
Marine border of Montenegro	MAP	UNDP	useful for field mapping
Municipality borders	MAP	UNDP	useful for field mapping
Counties	MAP	UNDP	
Counties	SHAPE	UNDP	
Forest administration unit borders	MAP	UNDP	
Forest administration unit borders	SHAPE	UNDP	useful for field mapping
Hydrology	MAP	UNDP	
Hydrology - pumping stations	MAP	UNDP	
Hydrology - Cisterns	MAP	UNDP	
Hydrology - Springs	MAP	UNDP	useful for field mapping



## Serbia, Montenegro and Natura 2000: Strengthening the Capacity of Governments and Civil Sector to Adapt to EU Nature Protection Acquis

Hydrology - Caves	MAP	UNDP	useful for field mapping
Hydrology - Reservoirs	MAP	UNDP	
Rivers	MAP	UNDP	useful for field mapping
Lakes	SHAPE	UNDP	useful for field mapping
Lakes	MAP	UNDP	
National Park borders (Biogradska gora, Durmitor, Lovcen, Skadarsko jezero)	MAP	UNDP	useful for field mapping
Roads	MAP	UNDP	
Roads	SHAPE	UNDP	useful for field mapping
Urban areas	MAP	UNDP	
Urban areas	SHAPE	UNDP	useful for field mapping
Pedology (soils)	MAP	UNDP	useful for field mapping
EMERALD sites boundaries	SHAPE	INP	

### 2.3 Relevant projects

#### FODEMO

FODEMO project is focused on the preparation of guidelines for a new Forest Management Planning (FMP) methodology. Its key elements are: stratification of forests by forest functions, **permanent plot sampling inventory**, use of remote sensing and digital mapping, use of silvicultural guidelines and forest development types (FDT), central FMP database. In order to achieve synergy between this project and the FODEMO and enable mutual benefit from results of the field inventories planned within both projects the methodology prepared by the FODEMO team has been supplemented by descriptions of target forest habitat types of the Habitat Directive Annex I. This ensures that the data gathered during forest inventory planned within FODEMO project will be compatible with those gathered by the WWF project.

As it has been stated the inventory planned in the framework of FODEMO project is based on permanent plot sampling. This means that field data on forest habitats will be gathered on randomly selected sample plots. The distribution of clusters and sample plots is based on a regular 2 km x 2 km quadrangle grid -basic grid. At each 2 km x 2 km main square grid point a cluster consisting of 4 sample plots is located. The 4 plots build a quadrangle with a side length of 200m.

Though this design of forest inventory is not suitable for mapping of all forest habitat types of the HD Annex I (e.g. those which are rare or distributed in small patches dependent on soil, substrate, elevation, exposition, etc.), the project could still deliver valuable field data on abundant (widely distributed) forest habitat types of HD Annex I. The preliminary guidelines for forest inventory are prepared ready for testing in the field, software for data analysis is being updated and a template for the new Forest Management Plans has been prepared too.

#### Important Plant Areas (IPA)<sup>1</sup>

Project identified 27 sites (see in Table 4a) for Montenegro based on criteria for IPA Programme for flora species and habitats types. The project report refers also on the occurrence of 33 Annex II plant species, which potentially occur in Montenegro (see Table 4b) and occurrence of habitats from the Annex I.

<sup>1</sup> Petrović, D., Karaman, M., 2009: Important Plant Areas in Montenegro – IPA Programme. Nevladinjo udruženje Zelena Gora, Podgorica. 79p.



**Serbia, Montenegro and Natura 2000: Strengthening the Capacity of Governments and Civil Sector to Adapt to EU Nature Protection Acquis**

*Table 4a: List of identified Important Plant Areas for Montenegro*

Number	Name of Important Plant Area	Area (ha)
1.	Babji Zub	4378
2.	Biogradska Gora	57330
3.	Brdo Spas	242
4.	Buljarica	156
5.	Dolina Grebaje	1112
6.	Dolina Rijeke Lim	2469
7.	Durmitor and Kanjon Rijeke Tare	35757
8.	Hajla	1551
9.	Jerinja Glava	295
10.	Kakaricka Gora	503
11.	Kanjon Rijeke Cijevne Sa Humom Orahovskim	3828
12.	Kanjon Rijeke Mrtvice	1413
13.	Kanjon Rijeke Pive	7344
14.	Katići, Donkova and Velja Seka	439
15.	Komovi	3332
16.	Kotorsko Risanski Zaliv	2778
17.	Ljubišnja	2831
18.	Lovčen	6267
19.	Lukavica	137
20.	Orjen	15027
21.	Platamuni	1698
22.	Rumija	2000
23.	Skadarsko Jezero	38388
24.	Trebjesa	126
25.	Velika Ulcinskaja Plaža and Ada Bojana	1014
26.	Visitor	1779
27.	Vrsuta	442

*Table 4b: List of Habitats Directive 92/43/EEC Annex II plant species (potentially) present in Montenegro (extracted from category Aii of Important Plant Areas project)*

Number	Species
1.	Adenophora lilifolia
2.	Androsace mathidae
3.	Bovista paludosa
4.	Buxbaumia viridis
5.	Campanula abietina (syn. Campanula patula subsp.abietina)
6.	Cephalozia macounii
7.	Cerastium dinaricum
8.	Cypripedium calceolus
9.	Cystoseira spinosa
10.	Dicranum viride
11.	Drepanocladus vernicosus
12.	Eryngium alpinum
13.	Fritillaria montana (syn. Fritillaria orientalis)
14.	Geum bulgaricum
15.	Gladiolus palustris
16.	Gomphus clavatus



## Serbia, Montenegro and Natura 2000: Strengthening the Capacity of Governments and Civil Sector to Adapt to EU Nature Protection Acquis

17.	<i>Himantoglossum caprinum</i>
18.	<i>Mannia triandra</i>
19.	<i>Marsilea quadrifolia</i>
20.	<i>Najas flexilis</i>
21.	<i>Narcissus angustifolius</i>
22.	<i>Neckera pennata</i>
23.	<i>Ophrys oestriphera</i> (syn. <i>Ophrys scolopax</i> ssp. <i>cornuta</i> )
24.	<i>Phylloporus pelletieri</i>
25.	<i>Posidonia oceanica</i>
26.	<i>Pulsatilla grandis</i> (syn. <i>Pulsatilla halleri</i> subsp. <i>Grandis</i> )
27.	<i>Ramonda serbica</i>
28.	<i>Sarcosphaera coronaria</i>
29.	<i>Scilla litardierei</i>
30.	<i>Trapa natans</i>
31.	<i>Weissia wimmeriana</i>
32.	<i>Zostera marina</i>
33.	<i>Zygodon forsteri</i>

### The study on biological diversity in Montenegro<sup>2</sup>

The project focused on drafting the country study on biodiversity of Montenegro, with identification of important features of biodiversity of different taxonomic groups of organisms, different ecosystems, importance of protected areas for preservation of biodiversity, legal and institutional framework for the protection of biodiversity, socio-economic aspect of protection and use of biological diversity and existing measures, programs and projects related to biodiversity. The working group on the preparation of the study included 20 specialists in individual most important groups of flora, fauna and agro-biodiversity. The Appendices include lists of important biodiversity features such as species of mosses, vascular plants, trees, invertebrates, marine and freshwater fish, amphibians and reptiles, birds, mammals. Those lists can be used for the preparation of preliminary country Reference lists of HD Annex II species for Montenegro. The study annex also includes complete list (country checklist) of vascular plants for Montenegro, which can be utilised for development of the Biodiversity Information System for HD Annex habitat types and species planned in the framework of this project.

#### 2.4 Scientific publications/articles

The following list of scientific publications enlists monographs, studies, articles, etc., which refer to occurrence of the Habitat Directive 92/43/EEC Annex habitat types and species on the territory of Montenegro.

#### Habitat types:

1. ADAM P., BIRKS, H. J. & WALTERS, S. M., 1972: A Contribution to the study of the Flora and Vegetation of the Budva area, Montenegro. - Glas. Rep. Zavoda Zašt. Prir. - Prir. Muzeja (Titograd) 4: 41-72.
2. BLAŽENČIĆ, J., & BLAŽENČIĆ Š., 1983: Fitocenološka studija zajednica *Charetum fragilis* Corillon 1957 i *Chareto-Nitellopsidetum obtusae* J. Blaž. ass. nova kod

<sup>2</sup> Ministry of Tourism and Environmental Protection, Podgorica, March 2008, prepared by Vasilije Bušković, Leader of the Team for preparation of the Strategy for the protection of biological diversity, with the Action Plan





## Serbia, Montenegro and Natura 2000: Strengthening the Capacity of Governments and Civil Sector to Adapt to EU Nature Protection Acquis

- Plavnice, na Skadarskom jezeru, Glasn. Republ. Zav. Zašt. Prir. i Prirod. Muz. (Titograd)
3. BLAŽENČIĆ, J. & CVIJAN, M., 1980: *Nitellopsis* Hy. (*Tolypellopsis* Mig.) - novi rod za floru Jugoslavije iz razdela Charophyta. - Glas. Rep. Zavoda Zašt. Prir. - Prirod. Muz. (Titograd), 7: 13.
  4. BLAŽENČIĆ J., 2007: Floristički pregled slatkovodnih makrofita u Crnoj Gori. - Glas. Rep. Zavoda Zašt. Prir. (Podgorica), 29-30: 43.
  5. BLEČIĆ, V. , 1958: Šumska vegetacija i vegetacija stena i točila doline reke Pive. Glasn. Prir. Muz. (Beograd) B (11) : 1-108, Doktorska teza.
  6. BLEČIĆ, V., & LAKUŠIĆ, R., 1976: *Prodromus* biljnih zajednica Crne Gore. - Glasn. Republ. Zav. Zašt. Prir. - Prirod. Muz. (Titograd) 9: 57-98.
  7. BULIĆ, Z., 1994: Flora i vegetacija kanjona rijeke Cijevne u Crnoj Gori - ekološko-fitocenološka studija, Magistarski rad, Biološki fakultet, Univerzitet u Beogradu, 1 - 284, rukopis.
  8. CERNJAVSKI, P., GREBENŠIČIKOV, O., & PAVLOVIĆ, Z., 1949: O vegetaciji i flori Skadarskog područja. Glasn. Prir. Muz. Srpske Zem. (Beograd) serija B.-knjiga 1 i 2. Beograd
  9. DÖMPKE S., 2008: Nacrt temeljne studije za osnivanje Regionalnog parka Delte Bojane, projektni izvještaj, nepublikovano
  10. DRAGICEVIĆ, S., 2001: Flora mahovina rijeke Mrtvice. Magistarski rad. Beograd
  11. GAMULIN-BRIDA, H., 1974: Biocenoses benthiques de la mer Adriatique. Acta Adriatica, vol. XV, No. 9., pp. 102
  12. GAMULIN-BRIDA, H., 1983: *Studia Marina* 13-14 pp: 205-213
  13. HORVAT, 1943. Ljetopis JAZU 46, Zagreb
  14. JANKOVIĆ, M., 1966: *Lauro-Castanetum* M. Jank., nova termofilna i eumediteranska zajednica pitomog kestena i lovora u Boki Kotorskoj, i njena subasocijacija *ericetosum* M.Jank. kao degradacioni stupanja, Arch. Biol. Sci., Beograd, 18 (1), 9P-10P.
  15. JANKOVIĆ, M. & BOGOJEVIĆ, R., 1965: *Robureto-Carpinetum orientalis*, nova asocijacija plavnih primorskih šuma kod Ulcinja. Arh. Biol. Nauka (Beograd) 17 (3): 15-16.
  16. JANKOVIĆ M., STEVANOVIĆ, V., 1983: Prilog poznavanju slatinske vegetacije Boke Kotorske. - Zbornik Roberta Visianija šibenčanina, Muzej grada šibenika 10: 377 - 396
  17. KARAMAN, V., 1997: Flora istočnog dela Bokokotorskog zaliva, Magistarski rad, Biološki fakultet, Univerzitet u Beogradu, 1 - 185, rukopis
  18. KARAMAN, G., GAMULIN-BRIDA, H., 1971. Contribution aux recherches des biocenoses benthiques du golfe de Boka Kotorska. *Studia Marina* 4., pp: 3-42
  19. LAKUŠIĆ, D., 2003: Ekološka i morfološka diferencijacija uskolisnih vijuka (*Festuca* L. subgen. *Festuca*) na prostoru Durmitora. PhD Teza. 37
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## Serbia, Montenegro and Natura 2000: Strengthening the Capacity of Governments and Civil Sector to Adapt to EU Nature Protection Acquis

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## Serbia, Montenegro and Natura 2000: Strengthening the Capacity of Governments and Civil Sector to Adapt to EU Nature Protection Acquis

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### 3. Conclusions and recommendations

The available scientific publications as listed above provide good basis for preparation of the country Reference lists of the habitat types listed in Annex I and species listed in Annex II, IV a V of the Habitats Directive 92/43/EEC for Montenegro. This will be the first step in making the inventory of annex habitat types and species in the country.



## **Serbia, Montenegro and Natura 2000: Strengthening the Capacity of Governments and Civil Sector to Adapt to EU Nature Protection Acquis**

The listed publications and the only available database with biodiversity data – the EMERALD database – will be though only of limited use for the planned identification of potential Sites of Community Interest (SCIs) of Natura 2000 network in Montenegro. This is partly due to age of the majority of the data and partly for the character of the data (low preciseness of geographical location). Practically, data older than 20 years are in case of many species and also for part of the habitat types only of limited (or even no) use. Inventory and digitalisation of existing data is however still important as it can provide a baseline for prioritisation of areas for field mapping and inventories. From the previously mentioned it is obvious that crucial part of the biological data concerning target habitat types and species necessary for the delineation of SCIs in Montenegro needs to be delivered through the field mapping and inventory. The project should therefore concentrate its capacities to field mapping of habitat types and field inventory of species.

For the planned desktop inventory of existing data on target habitat types and species (i.e. mainly digitalisation of existing analogue data) as well as for the field mapping some of the available digital datasets provide a good basis. The most valuable are the digitalised and georeferenced topographic maps of Montenegro in scale 1:25 000 which can be used for field works and for data digitalisation as well. Also some of the shapefiles available, such as river network, lakes, caves, but also roads, administrative borders, etc. can be used for pre-selection of target areas for field mapping and help during the field data digitalisation.

The field mapping of habitat types will require the Interpretation manual of Annex I habitat types for Montenegro to be prepared. The manual will include descriptions of habitat types of Community Interest present in Montenegro. As the project effort needs to concentrate now on the field mapping, it would be ideal to make the manual more comprehensive and include also at least brief descriptions of non-annex habitat types as well. In such a case the habitat manual can be considered as more comprehensive 'Catalogue of Habitats for Montenegro. This will enable more efficient use of resources provided for field works.

Preparation of the Catalogue of habitats would be however not an easy task as there is no national classification system of the vegetation or habitats available for Montenegro. As a substitute a classification systems of neighbouring countries, e.g. Croatia can be used as a guideline.

Day-to-day implementation of the Habitat Directive 92/43/EEC will also require a functional Biodiversity Information System to store data on Annex habitat types and species, provide data for various analyses, especially delineation of proposed SCIs, update of the data, preparation of site management plans, etc. The development of such information system (geodatabase) requires basic datasets to be available in the country. Such datasets are e.g. the checklists of flora and fauna species for Montenegro. Only checklist available is the checklist of vascular plants of Montenegro included in the Biodiversity Study of the Institute of Nature Protection from 2008. In case of data on fauna the information system will therefore need to work only with list of HD Annex II, IV and V species (Reference lists) for Montenegro or with checklists available for neighbouring countries.