

A STUDY OF INSTITUTIONAL STAKEHOLDERS' VIEWS ON BIODIVERSITY IN ROMANIA

Amelia ROTAR^{1,2,*}, Laurent SIMON¹, Petru URDEA² & Mircea VOICULESCU²

¹*Pantheon - Sorbonne University, Department of Geography, 191, Rue Saint Jacques, 75005 Paris, France*

²*University of the West, Department of Geography, Bvd. Vasile Pârvan, nr. 4, Timișoara, Romania*

* Author for correspondence (e-mail: amelia.rotar@yahoo.com)

Abstract: This paper inquires into the questions related to endangered habitats and species, as well as that of factors threatening biodiversity, in Romania, by analysing existing opinions of biodiversity institutional stakeholders. The research applies a combination of qualitative social science (participatory) approaches and quantitative tools as a means for understanding biodiversity related issues in Romania. Heterogeneity of opinions of biodiversity institutional stakeholders, concerning endangered biodiversity and its threats, are analysed. Stakeholders' perspectives are identified through characterization of opinion groups and discursive analysis. Key factors influencing the attitudinal diversity are examined. Research outputs reveal the diversity of existing stakeholders' views.

Keywords: biodiversity, stakeholders, Romania, Central Europe, endangered habitats, endangered species, threatened habitats, threatened species

1. INTRODUCTION

Some of the major causes of biodiversity decrease in Europe are habitat degradation, fragmentation and loss (Parmesan et al., 1999; Wettstein & Schmid, 1999; Abbitt et al., 2000; Tschardt et al., 2002; Fahrig, 2003; Henle et al., 2004; Thomas et al., 2004; Schweiger et al., 2005; Hendrickx et al., 2007; Billeter et al., 2008). The main underlying factors are the intensification of agriculture, i.e. the shift from low-intensity production systems to highly intensive managed farming areas (Tschardt et al., 2005; Kleijn et al., 2009) and the development of infrastructure, i.e. built-up areas ascribable to urbanization and industrialization and the transport network (Lövenhaft et al., 2004). The impact of human development on biodiversity is, however, not uniform. Moreover, climate change plays a major role in biodiversity decrease (Balmford et al., 2003; Thuiller et al., 2005).

Calls are out for the integration of conservation science and policy as a means to reduce the negative effects of continuing socio-economic development on protected and non-protected areas. In the present circumstances, the

integration of conservation science and policymaking is hindered by the lack of data on biodiversity. One potential way of approaching this issue is to identify the endangered habitats and species, as well as the threats to biodiversity, as emerging from the biodiversity stakeholders' perspectives.

2. STUDY AREA

Romania is located on the South-eastern side of Central Europe, and is situated between 43°37'07"-48°15'06" northern latitude and 20°15'07"-29°41'24" eastern longitude. Its surface is 237,502 km². As to its relief, the country is subdivided into three parts, of approximately equal sizes: mountains (approximately 28%), hills (approximately 40%) and plains (approximately 30%). The Carpathians expand as a long ridge throughout the country; their highest elevations exceeding 2500 m (max. 2543 m) and frequent elevations between 1000 and 1800 m (Velcea, Savu, 1983).

The climate is temperate, moderately continental. In Central and Western regions of Romania, notably within the Carpathian Range, there

is a temperate, Central-European climate; in South-western Romania, sub-Mediterranean-Illyrian influences appear. Finally, the Southern and Eastern regions of Romania are mostly under the control of an Irano-Turanian climate (Cristea, 1995). The relief and the location of the different climatic regions lead to various local climatic units. Mean annual rainfall quota is of 600-800 mm per annum, but precipitation mainly decreases from Northwest towards Southeast. However, local average rainfall quota varies significantly owing to the country's topological diversity. The highest annual rainfall quota appears in the high elevation areas of the Carpathians (about 1800 mm per annum) and minima appear in the Black Sea Coast area (about 400 mm per annum).

From a biogeographical point of view, Romania is highly diversified. The Romanian territory is characterized by the existence of 5 biogeographical regions, i.e. Pannonian, Continental, Alpine, Steppe and Pontic (Fig. 1). The extensive geographical diversity of this territory has resulted in great biological diversity. This includes more than 3700 species of vascular plants, and a fauna estimated to cover around 33 802 species. A large number of endemic and protected plant species, i.e. 228 (Ioraş, 2003) and animals, i.e. 1000, adapted to local conditions, have been identified. Endemism producing areas are in particular geographical areas of contact, where the interference of climatic influences has an influence on the shape of plants, determining the appearance of new adaptive traits (Opriş, 1963, in Antonescu et al., 1969).

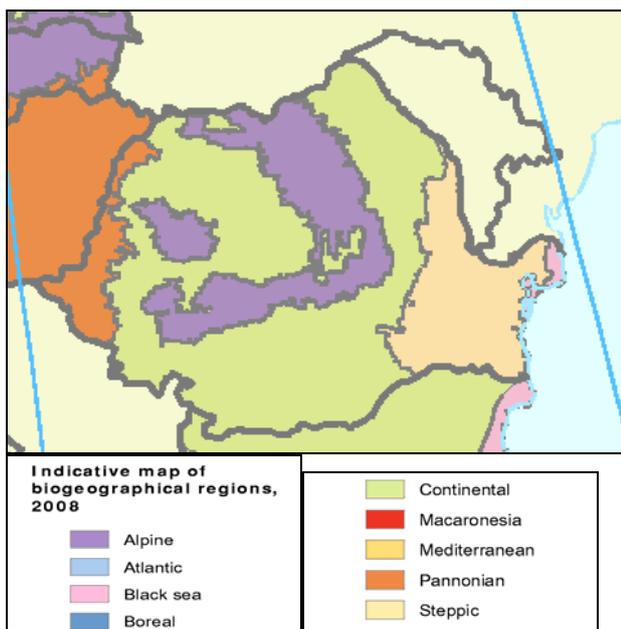


Figure 1. The 5 biogeographical regions of Romania (Source: European Agency for the Environment)

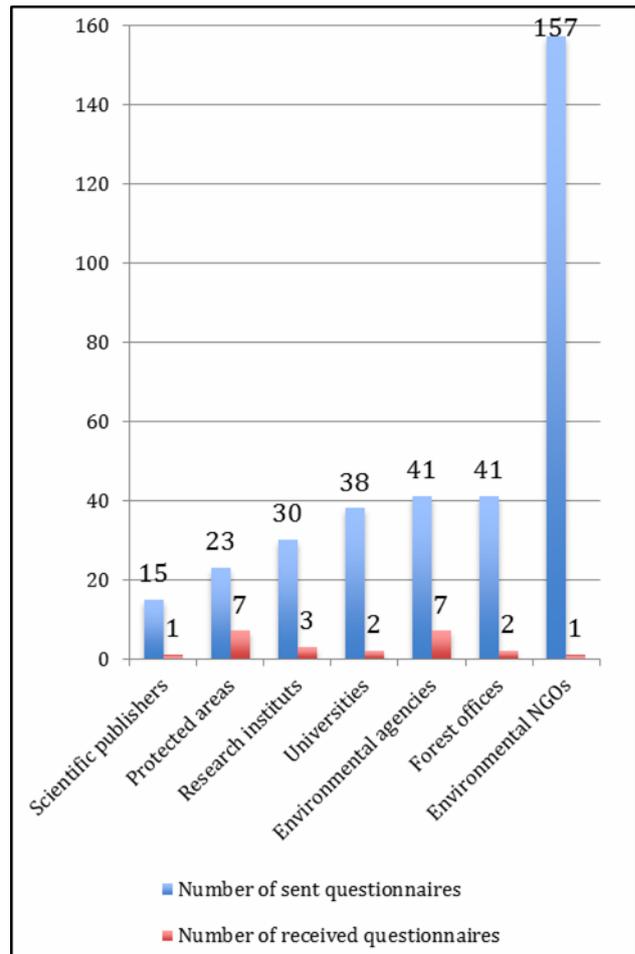


Figure 2. Number of sent questionnaires versus received questionnaires

3. METHODS

In order to analyze the issues related to endangered habitats and species, as well as that of factors threatening biodiversity, in Romania, in a first time, we decided to conduct a survey among institutional actors in Romania. In order to have the best representation possible, we decided to send questionnaires to all institutional actors having any tangencies to biodiversity (Table 1, Table 2).

Given the low level of initial participation (Fig. 2), we decided to send reminders. Finally, the total number of returned questionnaires was 23. The process of sending questionnaires, reminders and receiving completed questionnaires lasted from February to June 2009.

As to the questionnaires that we used, each questionnaire consisted of 7 parts: I. Preliminary Information; II. Biodiversity; III. Climate Change Impacts on Biodiversity; IV. Action Strategies and Recommendations; V. Contacts; VI. Publications; VII. Illustrations. In this paper we analyse the first two parts of this questionnaire (Fig. 3).

1) PRELIMINARY INFORMATION		
1.1.) Name:	...	
1.2.) Institution/Association:	...	
1.3.) Title:	...	
1.4.) Address:	...	
1.5.) Email:	...	
1.6.) Telephone:	...	
1.7) Institution / Association and region / geographical area for which you are filling in this questionnaire?		
...		
2) BIODIVERSITY ¹ (see Glossary)		
2.1) Which are, in your opinion, the most threatened natural habitats and species in your area (all threats comprised)?		
...		
2.2) Which are, in your opinion, the major current threats to local biodiversity, on the short term and on the long term? <i>Assign a score from 1 (low threat) to 5 (high threat)</i> ".		
short term	long term	threat :
		habitat destruction and fragmentation by human activities
		species overexploitation (fishing, hunting, forest exploitation)
		exotic invasive species
		pollution
		climate change ² (see Glossary)
		other :
		...
Comments :		...
Glossary :		
'Biodiversity: biodiversity reflects the number, the diversity and the variability of living organisms, as well as the way in which these aspects change from a place to another and throughout time. Biodiversity comprises diversity within a same species (genetic diversity), among species (species diversity) and among ecosystems (ecological diversity).		

Figure 3. The first two parts, analysed in this article, of the questionnaire that we used in our study

4. RESULTS AND DISCUSSION

4.1. Very low stakeholder participation rate

Despite numerous reminders and insistence from our part, the number of completed questionnaires was very low: the percentage of received questionnaires was 6.66% of the total number of sent questionnaires, i.e. 23 questionnaires received out of 345 sent (Table 1, Fig. 2).

The highest participation rate was that of protected areas, more precisely that of the persons in charge of the protected areas administrations, i.e. 30.43%, that is 7 questionnaires received out of 23 questionnaires sent. Rates above the average (i.e. 6.66%) were also obtained in the case of

environmental protection agencies (17.07%, i.e. 7 questionnaires out of 41) and of research institutes (10%, i.e. 3 questionnaires out of 10). On the opposite side, the lowest participation rate is that of non-governmental organizations (0.63%, i.e. 1 questionnaire out of 157). We must, however, mention, that a representative of a protected area that completed our questionnaire was, at the same time, the head of an NGO (one could, therefore, strictly speaking, consider that the number of NGOs that participated in our study is 2, not 1). Likewise below the average are found county forest offices (4.87%, i.e. 2 out of 41) and universities (5.26%, i.e. 2 out of 38). A participation rate equal to the average rate is that of scientific editions (6.66%, i.e. 1 out of 15).

As to the proportion of each class of participants in relation to the total number of completed questionnaires (Table 1), we noticed a high proportion of the environmental protection agencies rate, as is the case of the protected areas rate (30.43% for each of the two categories mentioned above, i.e. 7 out of 23 questionnaires for each case), followed by research institutions (13.04%, i.e. 3 of 23), universities and forest offices (8.69% each, i.e. 2 questionnaires each), NGOs and scientific editions (4.34% each, i.e. 1 questionnaire).

Table 1. Participation rate in our survey

<i>Institution type</i>	<i>Participation rate (percentage of received questionnaires / sent questionnaires)</i>
Protected areas	30.43% (7 out of 23 questionnaires)
Environmental Protection Agencies	17.07% (7 of 41)
Research institutes	10% (3 of 30)
Scientific publishers	6.66% (1 of 15)
Universities	5.26% (2 of 38)
Forest offices	4.87% (2 of 41)
Environmental NGOs	0.63% (1 of 157)
<i>Average rate</i>	<i>6.66 (23 of 345)</i>

4.2. Heterogeneous geographical distribution of respondents

Firstly, we want to specify that all the questionnaires that we sent were distributed uniformly in all regions (and counties, where applicable) of the country. Thus, within the process of sending out questionnaires, all the concerned stakeholders were contacted, uniformly across the country/regions/counties. The full list of stakeholders having responded to our questionnaire (Table 2) gives additional information with regard to the distribution of stakeholders across the country

(illustrated in Fig. 4).

Table 2. Types and names of institutions having completed the questionnaire

Type of institution that filled in our questionnaire	Name of the institution that filled in our questionnaire
Environmental Protection Agencies	EPA of Bihor County
	EPA of Covasna County
	EPA of Harghita County
	EPA of Hunedoara County
	EPA of Iasi County
	EPA of Prahova County
	EPA of Satu Mare County
Protected areas	Buila-Vânturarița National Park
	Călimani National Park
	Rodnei National Park (Biosphere Reserve)
	Apuseni Natural Park
	Grăditea Muncelului – Cioclovina Natural Park
	Mures Floodplain Natural Park
	Iron Gates Natural Park
Research Institutes	Biological Research Institute of Cluj-Napoca
	Forest Research and Management Institute
	“Grigore Antipa” National Museum of Natural History
Universities	Ovidius University of Constanta
	University of the West in Timisoara
Forest offices	Forest Office of Sibiu County
	Forest Office of Vaslui County
Environmental NGOs	Mama Terra Organisation of Bucharest
Scientific publishers	Bioflux of Cluj-Napoca

Moreover, the stakeholder participation list (Table 2) shows that the participation of natural parks - 4 completed questionnaires (there are 10 natural parks in total, so the participation rate in the case of natural parks is 40%) was higher than that of national parks - 3 completed questionnaires (there are 13 national parks in total, so the participation rate of national parks is 23%, which is roughly 50% of the natural parks participation rate). We must mention the fact that none of the Natura 2000 protected area custodians responded to our request to answer the questionnaire. Moreover, none of the Danube Delta Reserve administrative and/or scientific representatives filled in our questionnaire, despite numerous reminders from our part.

As to the geographical distribution of respondents, there is a concentration of participants in the Central and Northern Romania, i.e. in

Transylvania (Fig. 4). As to their distribution in relation to relief, we note an increased participation in mountainous areas (Fig. 4). One explanation for this phenomenon might be related to the fact that environmental issues awareness in Romania is higher in mountainous regions, as compared to lower altitudes (i.e. hilly regions and plains); this phenomenon could also be linked to the existing high concentration of protected areas mountainous regions, compared to non-mountainous regions (Fig. 4). Punctual stakeholders, i.e. research institutes, universities, NGOs and scientific publishers, having participated in our survey are located, as expected, in major Romanian cities, such as Bucharest (Romania's capital), Cluj-Napoca, Timișoara (main urban centres of Transylvania) and Constanța (Fig. 4).

4.3. Threatened habitats and species

As to Question 2.1. "What are, in your opinion, the most threatened natural habitats and species in your area (all threats comprised)?" (open answer question) of our questionnaire, we grouped all responses into 8 categories (Table 3, Fig. 5). We created these habitat groups with regard to the habitat typology adopted at European level within the framework of the directive underlying the Natura 2000 network (Council Directive 2006/105/EC). We furthermore compare these habitat groups with the Corine Land Cover categories (Fig. 6).

Thus, judging by the participants' answers to this question (Table 3, Fig. 5), the most threatened habitats are wetlands and aquatic habitats - 17 responses in total: 8 responses for the subcategory "wetlands" and 9 answers for the subcategory "aquatic habitats". Wetland habitats cited by respondents comprise several types of marshes, bogs and the Danube Delta. Aquatic habitats mentioned comprise stagnant waters, such as lakes (glacial, natural eutrophic), and (higher) water courses (including riverbanks). As to habitat threats, it is worth noting one respondent's mentioning of the "eutrophication phenomenon" as a threat to floristic species of oligotrophic marshes (Table 3).

The second important category (16 responses) is that of forested habitats (Table 3, Fig. 5). In this category, we noticed a clear preponderance of oak groves (oak is mentioned 4 times - more than any other species mentioned) and alluvial forests / gallery forests (including oak groves), i.e. forest habitats which are specific to lowland areas. This result is particularly surprising since the majority of respondents are located in mountainous regions, as we previously showed (Fig. 4).

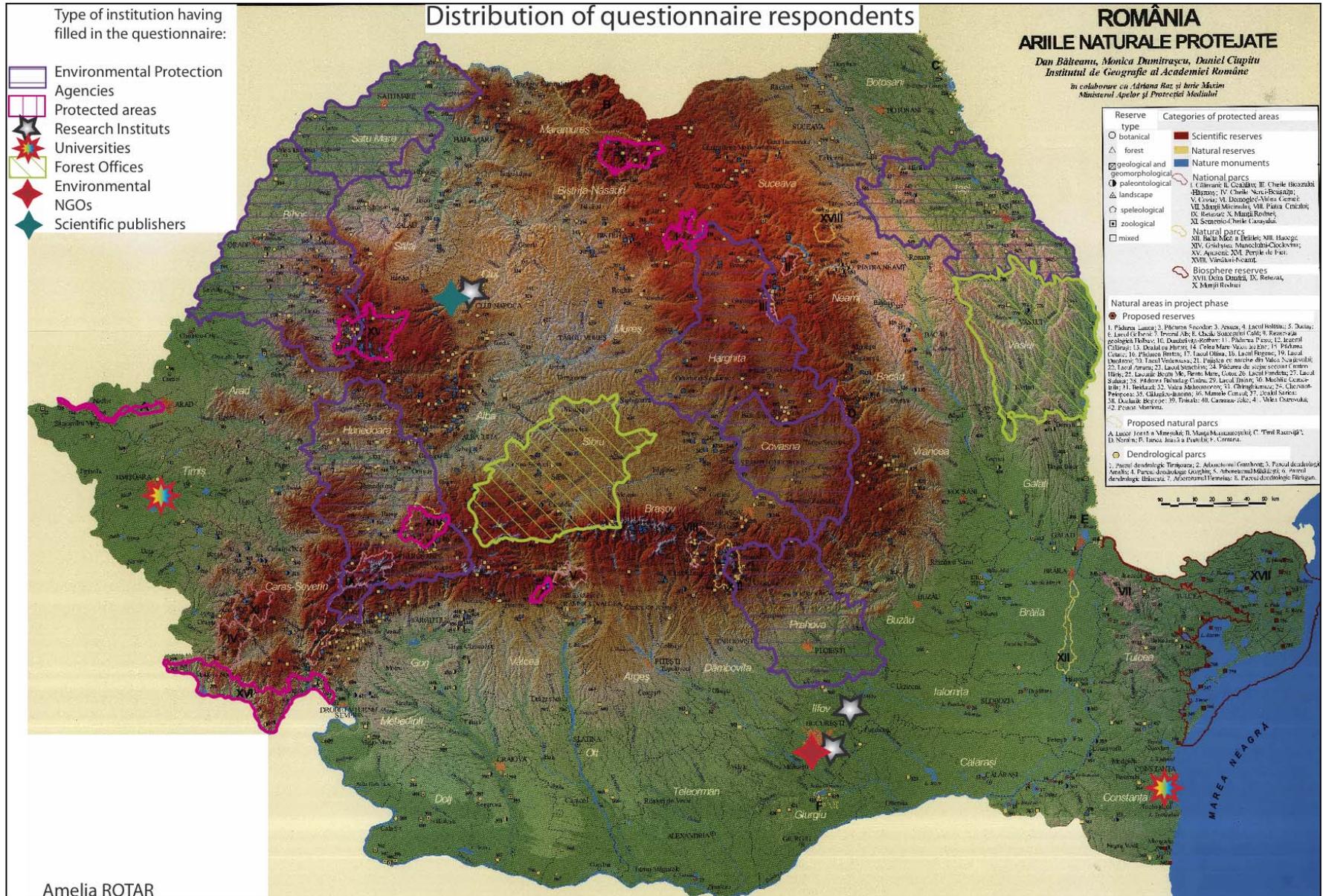


Figure 4. Distribution of questionnaire respondents (Rotar, 2010. Source: Bălteanu et al., 2003)

We would have expected, under these circumstances, that the most cited habitats be those habitats located primarily in mountainous regions; we must mention, once again, that the areas occupied by mountains, hills and plains are quite balanced in Romania - approximately one third of its surface is occupied by each of these three main forms of relief (Fig. 4).

Thus, a potential explanation related to a possible predominance of lowland areas in Romania that would explain the strong presence of lowland forest habitat among the answers is not viable in this case. We can therefore conclude that the forested habitats predominantly cited (i.e. oak and riparian groves) are actually perceived as being far more threatened, compared to any other type of forested habitat.

As to the next category, that of alpine and subalpine habitats (9 responses), we noted the double mentioning of mountain pine (*Pinus mugo*) shrubs; this fact is very probably linked to the almost endemic feature of this species.

The other habitat categories were considered less threatened by the respondents: steppe (4 responses), dunes (4 responses), halophyte and coastal habitats (3 responses), meadows and prairies (2 responses), and others (6 responses).

When comparing the endangered habitat groups pointed out by the respondents (Fig. 5) to the natural and semi-natural habitats of Romania (Corine Land Cover 2000, i.e. Fig. 6), we notice that some categories are over-represented, while others are under-represented. Thus, forests occupy 61% of the total Romanian natural and semi-natural land cover, but only 26% of the respondents think that forests represent endangered habitats. At the opposite pole, inland and maritime waters and wetlands occupy, in total, approximately 7% of the natural and semi-natural land cover, but 28% of the respondents consider wetlands and aquatic habitats to be threatened. The other categories left (pastures, scrub and/or herbaceous vegetation associations, open spaces with little or no vegetation) occupy approximately 32% of the total natural and semi-natural land cover, while the other categories of endangered habitats left (alpine and subalpine habitats, steppe, dunes, coastal and halophytic habitats, meadows and prairies, thickets, rocky habitats, caves, etc.) are considered to be threatened by 46% of the respondents.

As to the species considered as threatened, we grouped all the responses into two categories, i.e. Fauna and Flora (Table 4). Moreover, we grouped the Fauna category into several sub-categories: Mammals (with three sub-sub categories: Chiroptera, Rodentia and Carnivora), Reptiles,

Amphibians, Fishes, Birds, and Insects (Table 4). In addition, we pointed out, between brackets, whether a species was pinpointed as being threatened by more than one respondent. Some species were cited twice (by two distinct respondents); none of the species was mentioned by more than two respondents. In addition, species listed as most threatened by respondents were underlined (Table 4).

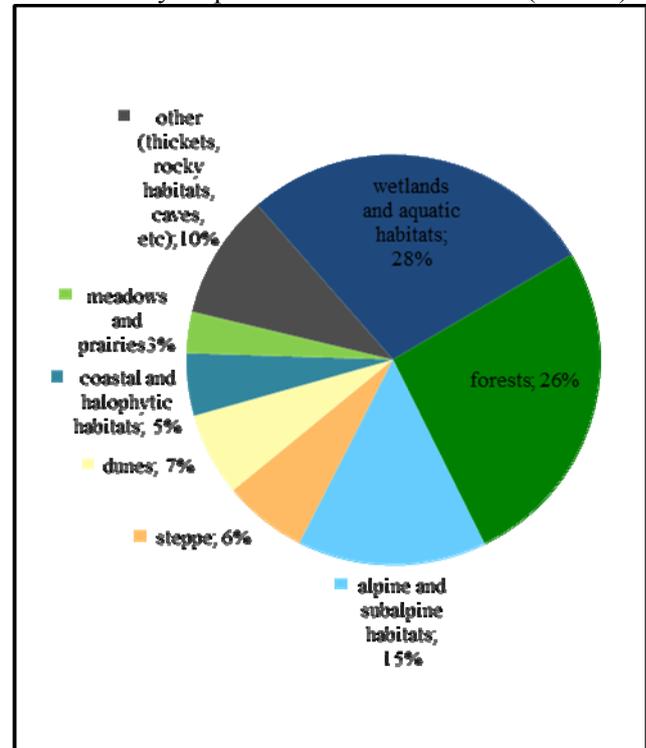


Figure 5. Endangered habitats, according to respondents

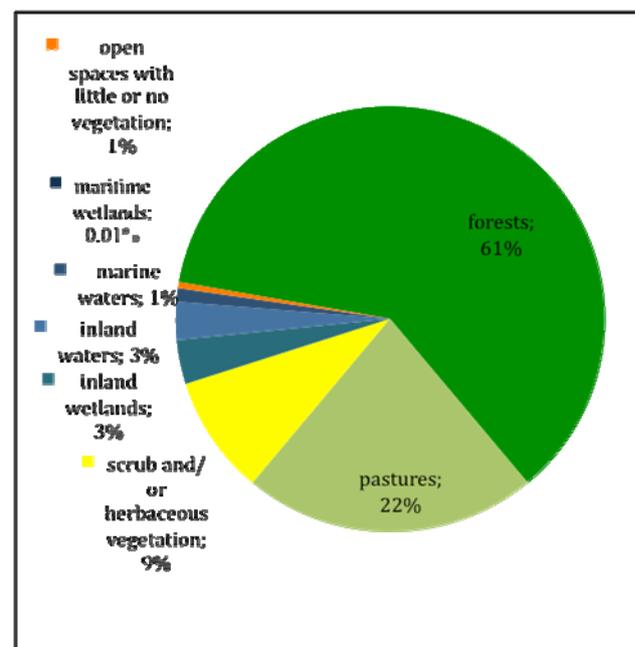


Figure 6. Natural and semi-natural habitats of Romania (Rotar, 2011. Source: Corine Land Cover 2000, Eionet - European Topic Centre on Spatial Information and Analysis, 2011).

Table 3. Threatened habitats, by category

wetlands and aquatic habitats total: 17 responses	forest habitats – total: 16 responses	alpine and subalpine habitats - 9 responses	steppe – 4 responses	dunes - 4 responses	halophyte and coastal habitats - 3 responses	meadows and prairies - 2 responses	others - 6 responses
<p>wetlands - 8 responses</p> <ul style="list-style-type: none"> - "Quell-Moor" subalpine marshes and their species - (oligotrophic) active bogs of high altitude ("tinoave") and their relic species - flora species of oligotrophic marshes, due to the eutrophication phenomenon - high altitude bogs, low altitude bogs, low altitude marshes - wooded bogs - eutrophic marshes and their relic species - Danube Delta Biosphere Reserve and its bird species - wetlands <hr/> <p>aquatic habitats - 9 responses</p> <ul style="list-style-type: none"> - alga, diatom, moss species and invertebrates of glacial lakes - headwaters of mountain areas - 3130 Stagnant waters, oligotrophic to mesotrophic, with Littorelletea uniflorae and / or Isoëto-Nanojuncetea vegetation - 3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition vegetation - Petea Lake from 1 Mai (Transylvanian lotus beds of hot sources) - species: <i>Scardinius racovitzai</i> (endemic) - aquatic ecosystems - aquatic habitats - freshwater habitats 	<ul style="list-style-type: none"> - 91E0 * Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) - 2 responses - 91F0 Mixed forests with <i>Quercus robur</i>, <i>Ulmus laevis</i>, <i>Ulmus minor</i>, <i>Fraxinus excelsior</i> or <i>Fraxinus angustifolia</i>, bordering major rivers (<i>Ulmenion minoris</i>) - 3 responses - 91H0 * Pannonian woods with <i>Quercus pubescens</i> - 91I0 * Euro-Siberian steppe wood with <i>Quercus</i> spp. - 2 responses - 91AA * Eastern white oak groves - 92A0 <i>Salix alba</i> and <i>Populus alba</i> gallery forests - 2 responses - mixed forests - forest habitats and their species - all forest ecosystems and their species - forest ecosystems - forests 	<ul style="list-style-type: none"> - arctic-alpine habitats - alpine meadows - 2 responses - rare or endemic flora of alpine meadows - alpine and subalpine ecosystems - subalpine meadows - subalpine scrubs - <i>Pinus mugo</i> scrubs - rare or endemic flora of <i>Pinus mugo</i> scrubs 	<ul style="list-style-type: none"> - 62C0 * Ponto-Sarmatic steppes - 2 responses - 6260 * Pannonian steppes on sands - steppe 	<ul style="list-style-type: none"> - 2130 * Fixed coastal dunes with herbaceous vegetation ("gray dunes") - 2190 Low intradunal depressions - 2340 * Pannonic inland dunes - maritime and inland dunes 	<ul style="list-style-type: none"> - 1530 * Pannonian salty steppes and marshes - 2 responses - coastal habitats and halophyte vegetation 	<ul style="list-style-type: none"> - hay meadows and prairies - meadows and prairies 	<ul style="list-style-type: none"> - scrubs - 40A0* peri-Pannonian subcontinental scrubs - rocky habitats - subterranean ecosystems - lowland areas - 2 responses - hilly areas

It seems relevant in the context of this study to give particular attention to species listed as threatened by two separate respondents.

Thus, we noted the presence of 5 bat species (including 4 of the *Myotis* genus): *Myotis bechsteini*, *Myotis blythi*, *Myotis myotis*, *Myotis dasycneme* and *Vespertilio murinus*. One aspect that is worth mentioning is the discrepancy between the strong presence of bat species among the species considered as threatened (respondents mentioned 18 bat species of which 5 were mentioned twice) and the fact that their main habitat, i.e. caves, i.e. subterranean ecosystems, was only mentioned once by the respondents (Table 3, category "Other responses").

As to rodents, there is only one species mentioned twice: *Neomys fodiens*, i.e. the water shrew. This species occurs in a wide variety of wetland habitats, both freshwater and coastal, including lakes, rivers, streams, marshes, bogs, damp grasslands, humid woodlands, seashores and intertidal wetlands and it is the most aquatic of all

European shrews (Hutterer et al., 2008, in IUCN, 2010). Loss of wetland habitats through drainage, development, conversion to agricultural land, and destruction of natural vegetation at the water's edge may have a negative impact on this species. It may suffer from a shortage of food when prey species decline owing to acidification and pollution of water with pesticides, fertilizers, and sewage (Hutterer et al., 2008, in IUCN, 2010).

As to carnivores, we noted the mention (once) of several mustelid species: *Lutra lutra*, *Mustela nivalis* and *Meles meles*, and, at the same time, the mention of the Mustelidae family. As to large carnivores, we noted the following response (accompanied by a note about the threatening cause): "large carnivores, due to habitat fragmentation (forest exploitations)" (Table 4.)

Respondents also indicated reptile, amphibian and fish species. The only fish mentioned twice is *Zingel streber*, endemic to the Danube and the Warda river systems, and living at temperatures of 5° C - 20 ° C (Freyhof, 2010).

Table 4. Endangered species

FAUNA	
	Mammals
	Chiroptera: <i>Barbastella barbastellus</i> , <i>Eptesicus serotinus</i> , <i>Myotis bechsteini</i> (2 responses), <i>M. blythi</i> (2 responses), <i>M. myotis</i> (2 responses), <i>M. dasycneme</i> (2 responses), <i>M. daubertoni</i> , <i>M. brandtii</i> , <i>M. nattereri</i> , <i>Myotis emarginatus</i> , <i>Nyctalus noctula</i> , <i>Pipistrellus pipistrellus</i> , <i>P. pygmaeus</i> , <i>P. nathusii</i> , <i>P. kuhlii</i> , <i>Plecotus auritus</i> , <i>P. austriacus</i> , <i>Vespertilio murinus</i> (2 responses);
	Rodentia: <i>Sicista subtilis</i> , <i>Sorex araneus</i> , <i>S. minutus</i> , <i>Cricetus cricetus</i> , <i>Micromys mynutus</i> , <i>Neomys anomalus</i> , <i>Neomys fodiens</i> (2 responses), <i>Crocidura leucodon</i> , <i>C. suaveolens</i> , <i>Muscardinius avellanarius</i> , <i>Dryomys nitedula</i> , <i>Eliomys quercinus</i> , <i>Glis glis</i> , <i>Spalax leucodon</i> , <i>Spalax graecus</i> ;
	Carnivora: <i>Lutra lutra</i> , <i>Felis silvestris</i> , <i>Mustela nivalis</i> , <i>Meles meles</i> , <i>Nyctereustes procynoides</i> : - Mustelidae - large carnivores, due to habitat fragmentation (forest exploitations)
	xx Reptiles: <i>Emys orbicularis</i> , <i>Vipera ursinii ssp. moldavica</i> (endemic), <i>Natrix natrix</i> , <i>N. tessellata</i> , <i>Coronella austriaca</i> , <i>Anguis fragilis</i> ; <i>Vipera berus</i> , <i>Ablepharus kitaibelli</i>
	xx Amphibians: <i>Triturus cristatus</i> , <i>Triturus vulgaris</i> , <i>Salamandra salamandra</i> , <i>Bombina bombina</i> , <i>B. variegata</i> , <i>Pelobates fuscus</i> , <i>Rana dalmatina</i> , <i>R. temporaria</i> , <i>Hyla arborea</i> ;
	xx Fishes: <i>Eudontomyzon danfordi</i> , <i>E. mariae</i> , <i>Umbra krameri</i> , <i>Zingel zingel</i> , <i>Zingel streber</i> (2 responses), <i>Acipenser ruthenus</i> , <i>A. stellatus</i> , <i>Cobitis taenia</i> , <i>Cyprinus carpio</i> (savage form), <i>G. kessleri</i> , <i>Leucaspis delineatus</i> , <i>Pungitius platygaster</i> , <i>Rhodeus sericeus amarus</i> , <i>Silurus glanis</i> (savage form), <i>Tinca tinca</i> ; - <i>Carassius carassius</i> eliminated in the competition with <i>C. gibelio</i> .
	x Birds: <i>Acrocephalus arundinaceus</i> , <i>Acrocephalus paludicola</i> , <i>Acrocephalus palustris</i> , <i>Acrocephalus schoenobaenus</i> , <i>Acrocephalus scirpaceus</i> , <i>Aegithalos caudatus</i> , <i>Alcedo atthis</i> , <i>Anser erythropus</i> (2 responses), <i>Aquila chrysaetos</i> (2 responses), <i>A. clanga</i> , <i>A. heliaca</i> , <i>A. pomarina</i> , <i>Ardea purpurea</i> (2 responses), <i>Ardeola ralloides</i> , <i>Aythya nyroca</i> , <i>Branta ruficollis</i> (2 responses), <i>Bubo bubo</i> , <i>Buteo rufinus</i> , <i>Ciconia ciconia</i> , <i>C. nigra</i> , <i>Circus cyaneus</i> , <i>C. macrourus</i> , <i>Circus pygargus</i> (2 responses), <i>Coracias garullus</i> (2 responses), <i>Corvus corax</i> (2 responses), <i>Crex crex</i> , <i>Cuculus canorus</i> , <i>Cygnus cygnus</i> , <i>Dendrocopos syriacus</i> , <i>Dryocopus martius</i> , <i>Egretta alba</i> (2 responses), <i>Egretta garzetta</i> (2 responses), <i>Falco cherrug</i> , <i>Falco peregrinus</i> (2 responses), <i>Falco tinnunculus</i> (2 responses), <i>Ficedula albicollis</i> , <i>Ficedula parva</i> , <i>Gallinago media</i> , <i>Gavia arctica</i> , <i>G. stellata</i> , <i>Grus grus</i> , <i>Haliaeetus albicilla</i> (2 responses), <i>Hieraetus pennatus</i> (2 responses), <i>Himantopus himantopus</i> , <i>Ixobrychus minutus</i> , <i>Jynx torquilla</i> , <i>Larus melanocephalus</i> , <i>Locustella luscinioides</i> , <i>Luscinia</i>

<p><i>svecica</i> (2 responses), <i>Merops apiaster</i>, <u><i>Milvus migrans</i></u> (2 responses), <i>M. milvus</i>, <i>Motacilla cinerea</i>, <i>Nycticorax nycticorax</i>, <i>Oriolus oriolus</i>, <i>Otis tarda</i>, <u><i>Pandion haliaetus</i></u>, <i>Parus palustris</i>, <i>Pernis apivorus</i>, <i>Phalacrocorax pygmaeus</i>, <i>Picus canus</i>, <i>Picus viridis</i>, <u><i>Platalea leucorodia</i></u> (2 responses), <i>Plegadis falcinellus</i>, <i>Podiceps griseigena</i>, <i>Porzana parva</i>, <u><i>Recurvirostra avosetta</i></u>, <i>Sterna albifrons</i>, <i>Streptopelia turtur</i>, <i>Strix uralensis</i>, <i>Sylvia nisoria</i>, <i>Tadorna ferruginea</i>, <i>Tetrao tetrix</i>, <i>Tetrao urogallus</i>, <i>Tetrastes bonasia</i> - species nestling on the ground (the large grouse, the black grouse)</p>
<p>Insects: <i>Callimorpha quadripunctaria</i> (1078*)</p>
<p>FLORA: <i>Achillea ptarmica</i>, <i>Agropyron triticeum</i>, <i>Amygdalus nana</i>, <i>Andromeda polifolia</i>, <i>Asparagus verticillatus</i>, <i>Beta trigyna</i>, <i>Betula humilis</i>, <i>Betula nana</i>, <i>Bupleurum apiculatum ssp. glaucocarpum</i>, <i>Campanula carpatica</i>, <u><i>Caragana frutex</i></u>, <i>Cardamine quinquefolia</i>, <i>Carex strigosa</i>, <i>Carpinus orientalis</i>, <i>Cephalanthera rubra</i>, <i>Corynephorus canescens</i>, <i>Cotinus coggygria</i>, <i>Crambe tataria</i>, <u><i>Cypripedium calceolus</i></u> (2 responses), <u><i>Dactylorhiza maculata</i></u>, <i>Dactylorhiza sp.</i>, <u><i>Dianthus capitatus ssp. andrzejowskianus</i></u>, <u><i>Dianthus pratensis ssp. racovitzae</i></u>, <i>Drosera anglica</i>, <i>Drosera obovata</i>, <i>Echium rossicum</i>, <i>Epipactis atrorubens</i>, <i>Epipactis palustris</i>, <i>Euonymus nanus</i> (2 responses), <i>Filipendula ulmaria</i>, <i>Fritillaria meleagris</i> (2 responses), <i>Fritillaria orientalis</i>, <i>Galanthus nivalis</i>, <i>Gentiana lutea</i>, <u><i>Hyacinthella leucophaea</i></u>, <i>Iris aphylla ssp. hungarica</i>, <i>Iris brandzae</i>, <i>Iris halophila</i>, <i>Iris humilis sbsp. arenaria</i>, <i>Lathyrus pannonicus ssp. collinus</i>, <i>Lepidium cartilagineum ssp. crassifolium</i>, <i>Leucojum aestivum</i>, <i>Leucojum vernum</i>, <u><i>Lilium martagon</i></u>, <i>Mercurialis ovata</i>, <i>Nectaroscordum siculum ssp. dioscoridis</i>, <i>Neottia nidus-avis</i>, <u><i>Numphar lutea</i></u>, <u><i>Nymphaea alba</i></u>, <u><i>Orchis coriophora</i></u>, <u><i>Orchis laxiflora ssp. elegans</i></u>, <u><i>Orchis mascula ssp. signifera</i></u>, <u><i>Orchis morio</i></u>, <u><i>Orchis purpurea</i></u>, <u><i>Orchis ustulata</i></u>, <i>Petrosimonia oppositifolia</i>, <i>Petrosimonia triandra</i>, <u><i>Phyllitis scolopendrium</i></u>, <i>Plantago schwarzenbergiana</i>, <i>Platanthera bifolia</i>, <i>Poa versicolor</i>, <i>Polemonium coeruleum</i>, <i>Polycnemum heuffelii</i>, <i>Polygala sibirica</i>, <i>Prunus tenella</i>, <i>Pulsatilla pratensis ssp. hungarica</i> (4110*), <u><i>Pulsatilla vulgaris ssp. grandis</i></u>, <i>Rumex tuberosus</i>, <u><i>Salvinia natans</i></u>, <i>Saxifraga hirculus</i>, <i>Senecio fluviatilis</i>, <i>Serratula radiata</i>, <i>Serratula wolffii</i>, <i>Seseli tortuosum</i>, <i>Silaum silaus</i>, <i>Silene chlorantha</i>, <i>Sisymbrium polymorphum</i>, <i>Stemmacantha serratuloides</i>, <i>Torilis nodosa</i>, <u><i>Tulipa biebersteiniana</i></u> (2 responses), <u><i>Utricularia vulgaris</i></u>, <u><i>Vitis sylvestris</i></u> - orchids - flora and fauna species sensitive to overgrazing / over fertilizing effects * underlined species are the most threatened</p>

As to birds, almost all the species listed twice (numerous species were listed) are either raptors - 7 species in total, or migratory birds which have an existence strongly linked to the presence of wetlands and aquatics habitats - 6 species in total (Bruun et al., 1999):

□ Raptors:

- *Aquila chrysaetos*
- *Circus pygargus*
- *Falco peregrinus*
- *Falco vespertinus*
- *Haliaeetus albicilla*
- *Hieraetus pennatus*
- *Milvus migrans*

□ Migratory birds, for which the presence of wetlands and aquatic habitats is vital and for which the Danube Delta is the main habitat on the Romanian territory (Bruun et al., 1999):

- *Anser erythropus*
- *Ardea purpurea*
- *Branta ruficollis*
- *Egretta alba*
- *Egretta garzetta*
- *Platalea leucorodia*

□ Others:

- *Coracias garullus*
- *Corvus corax*
- *Luscinia svecica*

As to plant species, there are only four species mentioned twice:

- *Cypripedium calceolus* – orchidaceous species, helophytic or semi-shade, neutrocalcicole, generally present in open stands and on wood fringes (Rameau et al., 1993). The essential factor in its ecological behaviour is its preference for certain dynamic developmental stages of forest colonization and for certain types of forest stands. Thus the presence of this species varies from abandoned lawns to forest clearings, passing by wood fringes - hems and coats. As to the factors threatening this species, it is to be noted that any strong and lasting closure of forest coverage or clearings, whether it is linked to natural dynamics or human intervention, constitutes a threat to the species. To this threat are added wood fringe destruction and certain works (Bensettiti et al., 2002)

- *Euonymus nanus* - glacial relict

- *Fritillaria meleagris* - typical lowland species, never rising to high altitudes; present in wet and floodable meadows. Habitat threats are causing a strong regression of the species: wetlands drainage, poplar grove plantations in alluvial valleys, hydraulic projects, etc. (Motard et al., 2000).

- *Tulipa biebersteiniana* - edifying species for habitat 9110 * Euro-Siberian steppe wood with *Quercus* spp. (Doniță et al., 2005) - this habitat was

previously mentioned (twice) by respondents (Tab. 3).

These last three species, i.e. *Euonymus nanus*, *Fritillaria meleagris* and *Tulipa bibersteiniana* can coexist in certain habitats, such as temporarily flooded oak groves, as is the case of the forest and botanical reserve of Bălteni in Vaslui County (Eastern Romania), where all of these three species were observed on the same perimeter (Mohan et al., 1993; Dobrescu, 1968).

4.4. Ranking threats to biodiversity

The following question of our questionnaire focuses on threats to biodiversity: "2.2) Which are, in your opinion, the major current threats to local biodiversity, on the short term and on the long term? Assign a score from 1 (low threat) to 5 (high threat)".

Questionnaire responses show that, according to respondents, habitat destruction and fragmentation represent the main threat to biodiversity, on the short term, as well as on the long term, with an average rating of 3.48 out of 5 for the short term and 4.22 out of 5 for the long term (Tab.4, Fig.7).

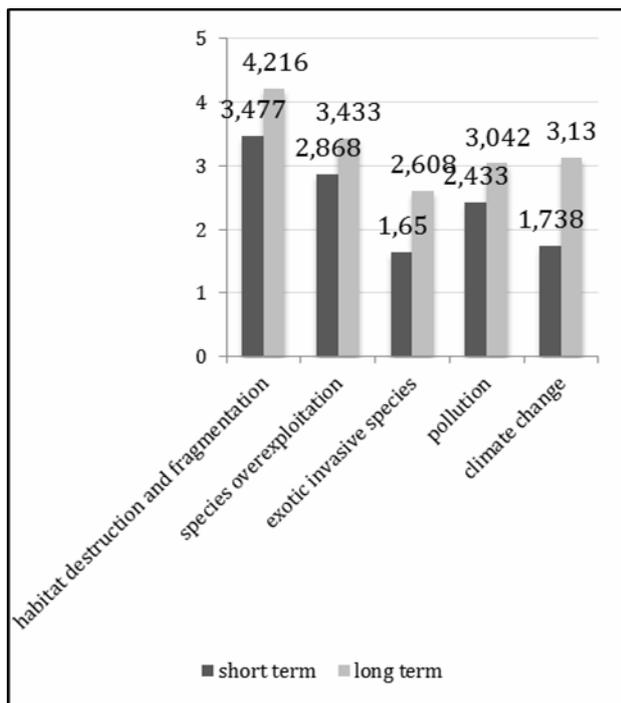


Figure 7. Threats to biodiversity (respondents' average scores)

This threat is followed by the threat of species over-exploitation (2.87 for the short term and 3.43 for the long term). Pollution is on the third place in the hierarchy of biodiversity threats (2.43 for the short term and 3.04 for the long term).

Table 5. Other threats mentioned by respondent

Threats mentioned by respondents in the category "other threats" and assigned averages:
<p>Extension of the built environment:</p> <ul style="list-style-type: none"> -the sprawling of city suburbs towards protected areas, leading to the loss of buffer zones (scores - short term: 5; long term: 5) -construction of tourist facilities in protected areas : 5 +5 -creation of new ski runs and use of artificial snow: 5 +5 -road construction in protected areas: 5 +5 -infrastructure development: highways, utilities; sprawling of city suburbs, of tourist facilities: 3 +4 -constructions: 2 +4
<p>Attitudes</p> <ul style="list-style-type: none"> -low degree of information and of public awareness: 5+5 -passive attitude of people with regard to species extinction: 5+5 -lack of public respect for nature: 5+5
<p>Legislation</p> <ul style="list-style-type: none"> -legislative lacunas: 5 +5 -incoherent, unstable legislative framework: 3 +4
<p>Management</p> <ul style="list-style-type: none"> -absence of protected areas' management structures: 5+5 -grazing in protected areas and burning of the alpine scrubs with a view to obtain new grazing plots: 5 +5 -anthropisation (placing plots out of the forest land use category by forest clearing and changing their land use category with a view to investments): 5 +5 -overuse of water resources (by capturing water sources or by redirecting water courses through pipes): 5 +5 -inexistence of quality management/management plans:3+4 -inexistence of cadastre: 3 +4 -absence of law enforcement: 3 +4
<p>GMOs: 1 +3</p>
<p>Comments:</p> <p>-"The most important problem is, in fact, the lack of public awareness, manifested in: lack of respect towards nature, lack of a minimal education in the field of environment, in order to arrive to a good level of information and awareness in relation to what nature represents for humanity – to the fact that nature is vital. Unfortunately, this lack of ecological awareness is massively present in the political and decision-making classes, this situation being visible in the astonishing speed with which the specific legislation is modified, in the abrogation of certain articles and the introduction of others, based on personal interests, as well as the mismatch between normative acts amid themselves, but also the socio-economic context of the country. Note the same lack of awareness among the local population in relation to legal standards to be respected in the natural protected areas and in relation to protected species of flora and fauna; this situation is due to the lack of ecological education, to a reduced level of information and to a low living standard. "</p> <p>-"Development of an ecological awareness starting from elementary school, fund raising in order to get the students involved in projects related to environmental protection, particularly in protected areas"</p>

It is only on the fourth (penultimate) position

in the hierarchy of threats that is positioned climate change (with a 1.74 out of 5 average for the short term and 3.13 for the long term). Judging by the ratings given by the respondents, we can deduce that climate change is not considered to be a real threat to biodiversity, at least compared to the other threats listed. On the fifth and last place are placed the invasive alien species (1.65 for the short term and 2.61 for the long term).

Moreover we noted the discrepancy between the scores assigned to threats on the short-term and those on the long term (Table 4 & Table 5) - this is notably the case of climate change, where there is a difference of 1.39 points (an average of 1.74 for the short term and 3.13 for the long term).

5. CONCLUSIONS

Although stakeholder participation in our survey was very low, i.e. 6.66% (i.e. 23 completed questionnaires out of 345 sent questionnaires), the data that we collected within the framework of this survey and the results of this study are compelling.

Thus, the most endangered habitats (all threats combined) are considered to be wetlands and aquatic habitats, but also forests (notably oak groves). As to endangered species, each class of species is represented on our list, but special attention was given by the respondents to bird species, as well as plant species (judging by the number of species listed by respondents).

Major threats to biodiversity are notably those related to habitat destruction and fragmentation, but not solely. We also noted the strong discrepancy between the scores assigned by respondents to short term threats as compared to long-term threats.

ACKNOWLEDGEMENTS

We would like to thank all of the questionnaire respondents who answered our questions.

REFERENCES

- Abbitt, R.J.F., Scott, J.M. & Wilcove, D.S.**, 2000. *The geography of vulnerability: incorporating species geography and human development patterns into conservation planning*. Biological Conservation, 96, 169-175.
- Antonescu, C., Călinescu, C., Bănărescu, P.**, 1969. *Biogeography of Romania* (Biogeografia României), Edit. Științifică, București, 410 pp.
- Balmford, A., Green, R.E. & Jenkins, M.** 2003. *Measuring the changing state of nature*. Trends in Ecology and Evolution 18, 326-330.
- Bensettiti, F., Gaudillat, V., Malengrau, D. & Quéré, E.**, 2002. *Habitat notebooks Natura 2000. Knowledge and management of habitats and of species of community interest. Tome 6. Vegetation species*. (Cahiers d'habitats Natura 2000. Connaissance et gestion des habitats et des espèces d'intérêt communautaire. Tome 6. Espèces végétales.) La Documentation française, 271 pp.
- Bălțeanu D., Dumitrașcu Monica, Ciupitu D.**, 2003. *Romania. Natural protected areas. Mural map, scale 1:1000000* (România. Ariile naturale protejate. Hartă murală, scara 1:1000000), Editura Academiei Române, București.
- Billeter, R., Liira, J., Bailey, D., Bugter, R., Arens, P., Augenstein, I., Aviron, S., Baudry, J., Bukacek, R., Burel, F., Cerny, M., De, Blust.G., De Cock, R., Diekötter, T., Dietz, H., Dirksen, J., Durka, W., Frenzel, M., Hamersky, R., Hendrickx, F., Herzog, F., Klotz, S., Koolstra, B., Lausch, A., Le Coeur, D., Maelfait, J.P., Opdam, P., Roubalova, M., Schermann, A., Schermann, N., Schmitt, T., Schweiger, O., Smulders, M.J.M., Speelmans, M., Simova, P., Verboom, J., van Wingerden, W., Zobel, M. & Edwards, P.J.**, 2008. *A unique, large-scale perspective on biodiversity conservation in European agro-ecosystems*. Journal of Applied Ecology 45, 141-150.
- Bruun, B., Deline, H. & Stevansson, L.**, 1999. *Birds of Romania and of Europe* (Păsările din România și Europa), Hamlyn Guide, Societatea Ornitologică Română, Octopus Publishing Group Ltd, London, 36-90
- Eionet - European Topic Centre on Spatial Information and Analysis**, 2011. *Corine Land Cover 2000*.
- European Commission**, 2006. *COUNCIL DIRECTIVE 2006/105/EC of 20 November 2006 adapting Directives 73/239/EEC, 74/557/EEC and 2002/83/EC in the field of environment, by reason of the accession of Bulgaria and Romania*, Official Journal of the European Union, 368-408.
- Cristea, V.**, 1995. *La conservation de la nature en Roumanie*. L' Uomo e l' Ambiente, Camerino (Macerata): Universita degli Studi, Italy, 18: 1-104.
- Dobrescu, C.**, 1968. *Floristic and geobotanical contributions regarding the forest of Bălteni, Vaslui* (Contribuții floristice și geobotanice referitoare la pădurea Bălteni, Vaslui). Analele Univ. „Al.I. Cuza” Iași, Serie nouă, Sect. II-a. Biol., Iași, 14(1), 147-158.
- Doniță, N., Popescu, A., Paucă-Comănescu, M., Mihăilescu, S., Biriș, I.A.**, 2005. *Habitats of Romania*, (Habitatele din România). Editura Tehnică Silvică, București (in Romanian), 231-232.
- Fahrig, L.**, 2003. *Effects of habitat fragmentation on biodiversity*. Annual Review of Ecology, Evolution and Systematics, 34, 487-515.
- Freyhof, J.** 2010. *Zingel streber*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.1.
- Hendrickx, F., Maelfait, J.P., van Wingerden, W.**

- Schweiger, O., Billeter, R., Speelmans, M., Augenstein, I., Aviron, S., Bailey, D., Bukacek, R., Diekötter, T., Dirksen, J., Herzog, F., Liira, J., Roubalova, M., Vandomme, V. & Bugter, R., 2007. *How landscape structure, land-use intensity and habitat diversity affect components of arthropod diversity in agricultural landscapes*. Journal of Applied Ecology 44, 340–351.
- Henle, K., Davis, K.F., Kleyer, M., Margules, C. & Settele, J., 2004. *Predictors of species sensitivity to fragmentation*. Biodiversity and Conservation, 13, 207-251.
- Hutterer, R., Meinig, H., Bertolino, S., Kryštufek, B., Amori, A., Sheftel, B., Stubbe, M., Samiya, R., Ariunbold, J., Buuveibaatar, V., Dorjderem, S., Monkhzul, Ts., Otgonbaatar, M. & Tsogbadrakh, M., 2008. *Neomys fodiens*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4.
- Ioras, F., 2003. *Trends in Romanian biodiversity conservation policy*. Biodiversity and Conservation, 12, 9-23.
- Kleijn, D., Kohler, F., Báldi, A., Batáry, P., Concepcion, E.D., Clough, Y., Diaz, M., Gabriel, D., Holzschuh, A., Knop, E., Kovács, A., Marshall, E.J.P., Tscharrntke, T. & Verhulst, 2009. *On the relationship between farmland biodiversity and land-use intensity in Europe*. Proceedings of the Royal Society B 276, 903-909.
- Lövenhaft, K., Runborg, S. & Sjögren-Gulve, P., 2004. *Biotope patterns and amphibian distribution as assessment tools in urban landscape planning*. Landscape and Urban Planning 68, 403-427.
- Mohan, Gh., Ardelean, A. & Georgescu, M., 1993. *Nature reserves and monuments of Romania (Rezervații și monumente ale naturii din România)*, Casa de Editură și Comerț „Scaul”, București, 359 pp.
- Motard, E. & Bajon, R., 2000. *Fritillaria meleagris* L.. In Muséum national d'Histoire naturelle [Ed]. 2006. Conservatoire botanique national du Bassin parisien.
- Parmesan, C., Ryrholm, N., Stefanescu, C., Hill, J.K., Thomas, C.D., Descimon, H., Huntley, B., Kaila, L., Kullberg, J., Tammaru, T., Tennent, W.J., Thomas, J.A. & Warren, M., 1999. *Poleward shifts in geographical ranges of butterfly species associated with regional warming*. Nature, 399, 579-583.
- Rameau, J.C., Mansion, D., Dumé, G., 1993. *Forest flora of France. Illustrated ecological guide, volume 2* (Flore forestière française. Guide écologique illustré, volume 2), Institut pour le développement forestier, Paris, 1291.
- Schweiger, O., Maelfait, J.P., van Wingerden, W., Hendrickx, F., Billeter, R., Speelmans, M., Augenstein, I., Aukema, B., Aviron, S., Bailey, D., Bukacek, R., Burel, F., Diekötter, T., Dirksen, J., Frenzel, M., Herzog, F., Liira, J., Roubalova, M. & Bugter, R., 2005. *Quantifying the impact of environmental factors on arthropod communities in agricultural landscapes across organisational levels and spatial scales*. Journal of Applied Ecology 42, 1129-1139.
- Thomas, C.D., Cameron, A., Green, R.E., Bakkenes, M., Beaumont, L.J., Collingham, Y.C., Erasmus, B.F.N., Martinez Ferreira de Siqueira, Grainger, A., Hannah, L., Hughes, L., Huntley, B., van Jaarsveld, A.S., Midgley, G., Miles, L., Ortega-Huerta, M.A., Peterson, A.T., Philips, O.L. & Williams, S.E., 2004. *Extinction risk from climate change*. Nature, 427, 145- 148.
- Thuiller W., Lavorel, S., Araújo, M.B., Sykes, M.T. & Prentice, I.C., 2005. *Climate change threats to plant diversity in Europe*. Proceedings of the National Academy of Sciences, USA, 102(23), 8245-8252, 2005
- Tscharrntke, T., Klein, A.M., Kruess, A., Stefan-Dewenter, I. & Thies, C., 2005. *Landscape perspectives on agricultural intensification and biodiversity ecosystem service management*. Ecology Letters 8, 857-874.
- Tscharrntke, T., Steffan-Dewenter, I., Kruess, A. & Thies, C., 2002. *Characteristics of insect populations on habitat fragments: a mini review*. Ecological Research, 17, 229-239.
- Velcea, A., Savu, Al., 1983, *Geografia Carpaților și a Subcarpaților Românești*, Edit. Did. și Pedag., București, 300 pp.
- Wettstein, W. & Schmid, B., 1999. *Conservation of arthropod diversity in montane wetland: effect of altitude, habitat quality and habitat fragmentation on butterflies and grasshoppers*. Journal of Applied Ecology, 36, 363-373.

Received at: 03. 09. 2011

Revised at: 19. 02. 2012

Accepted for publication at: 22. 02. 2012

Published online at: 24. 02. 2012