GAP ANALYSIS OF PROTECTED AREAS IN THE DINARIC ARC ECO-REGION WITH FOCUS ON ALBANIAN RESULTS

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Abstract:

One of basic goals of the scientific part of the Program of Work on Protected Areas of the Convention of Biological Diversity is a Protected Area Gap Analysis. Gap analysis is to be produced and made available to all key actors involved by mid-2009. in order to help countries within the region to fulfill this goal the WWF Protected Areas for a Living Planet – Dinaric Arc Eco-region Project supported the preparation of Protected Area Gap Analysis in the Dinaric Arc eco-region. One of the most important aspects of the gap analysis is that it provides a new broader perspective of the region's biodiversity. By identifying areas with little or no protection, more sound management decisions in planning a protected area network can be made. The gap analysis compares biodiversity distribution with current protected area systems, in order to identify areas where species and ecosystems are unprotected or under-protected. The analysis showed that the level of protected area designations in the DAE is not sufficient to ensure adequate biodiversity protection.

Keywords: biodiversity, protected areas, gap analysis, Dinaric Arc eco-region.

1. Introduction

The Dinaric Arc region remained poorly known and studied by both European and international naturalists for a long time. Previously, the region was generally thought to be savage and too wild, with the additional wrong attribution bestowed during the decades of political instability. However, times are changing and the world is becoming increasingly aware of the importance of this area, one of Europe's biodiversity hotspots, which is becoming a kind of a promised land for researchers from all over the world.

The Dinaric Arc, extending from its border area with the Alps in Slovenia through Croatia and covering a large part of Bosnia and Herzegovina and Montenegro, ends in the north of Albania. The Dinarides also partly penetrate into Serbia, Kosovo, and Macedonia. The area is characterized by a central mountain range that extends towards the Adriatic coast and borders on the north with the Pannonian Plain. However, the region is not uniform. Different authors have divided the region into several bio-geographical subunits, mainly running from the northwest to the southwest [4].

An extraordinarily fragmented landscape, diverse geological composition, the impacts of different climate types, and the "invasion" of neighboring bio-geographical territories all contribute to the high biodiversity of the area, which is (was) favored by the relatively slow economic development and predominantly traditional agricultural practices. Extensive and well-preserved forests still cover a great part of the area, offering shelter to significant resident populations of large carnivores, such as the brown bear, lynx, and wolf.

Due to its geological compositions consisting mainly of carbonates, the whole area is characterized by karst phenomena. Water erosion transformed carbonate bedrock into surface and underground karst features, home to some unique species, including the proteus, an exclusive inhabitant of the Dinaric underground. The cave system of the Dinaric Arc represents the largest underground river system in Europe, and is therefore an extremely important source of water for the entire region.

The mountainous region of the central Dinarides is rapidly changing towards the seaside landscapes, where the harsh climate of the interior is mitigated by the influence of the Mediterranean Sea. The Eastern Adriatic coast, with its highly rugged, mainly rocky coast line, is one of the most beautiful and best preserved ones in the whole Mediterranean. Karst geomorphology is also reflected in marine habitats. Bays, sea caves, and submerged cliffs are specific elements of the eastern Adriatic seascape. Low coastal areas are scarce and mainly limited to the southernmost part of the region. They are all highly influenced by human activities.

The warm Mediterranean climate entering through the river valleys towards the interior has a relevant impact on the diversity of flora and fauna. Frequently, especially on the steepest slopes, different altitude-characterized habitats can be found within short distances of each other.

During glacial periods, the major part of this area remained south of the ice shield that used to cover Central Europe. Some animal and plant species previously inhabiting a large part of Europe survived the ice ages in the ice-free refugee throughout the area. Thus, the number of endemic species, i.e. species encountered only here and nowhere else, is very high.

Although the nature of the Dinaric area is relatively well preserved, economic development and inappropriate environmental policies represent a potential concern for regional biodiversity. The protection of nature is insufficient in many places. While some extensive areas of high biodiversity remain unprotected, others, though protected, lack an appropriate form of management which could maintain this diversity.

2. Material and Methods

Gap Analysis can help throw light upon gaps in the system of protected areas. It is a method for identifying the degree to which biodiversity is represented in a mosaic of conservation lands in order to provide land managers and policy makers with the information they need to make appropriate decisions. In its simplest form, a Gap Analysis involves comparing the distribution of biodiversity with the distribution of protected areas and finding the localities where species and ecosystems are left unprotected or under-protected. Species and communities that are not adequately represented in the existing network of conservation lands constitute conservation “gaps” [1].

By identifying areas with little or no protection, one can make more sound management decisions in planning a protected area network. The importance of protected areas has been widely recognized, and numerous national and international agreements and laws consider protected areas as the core of any conservation strategy. Namely, one of the most efficient ways to protect biodiversity is to maintain viable populations in natural ecosystems. However, a number of studies have demonstrated that protected areas often do not adequately represent the biodiversity of a region which also refers to the DAE.

From the beginning, the purpose of the project was to collect publicly accessible data. The quality of available data for the analysis differs a great deal between countries. Some countries have provided comprehensive and accurate data, while for others; data was of a very poor quality or does not exist at all. Therefore, in order to present as relevant a situation as possible, it was required to work with data that are representative at the regional level. In other words, this means that even data that were either too precise or too poor for a country could reflect a wrong image for the entire region.

On basis of existing data, range maps of each biodiversity target were made. Gap Analysis is based on three main sets of data components: spatial orientation of various habitats, the distribution of biodiversity components, and map of areas already protected. The Gap Analysis was executed using GIS software. Distributional maps were overlaid with shapes of protected areas. The result was the statistical

representation of targets in protected areas within countries. Gaps among countries were analyzed and discussed separately, according to each group of biodiversity targets. A separate analysis of distribution of protected areas throughout different altitudinal belts was carried out and maps, with relevant hotspots of each of the animal species groups, were interpreted and built.

Target species and habitats that are not adequately represented in PAs are gaps. For our purpose, gaps are defined as targets the range of which (or surface) is less then 10 % represented in a PA. Targets that are not represented at all in PAs are considered total gaps.

Targets represented more than 10 % in PAs are considered covered. The choice of the 10 % threshold value is on the one hand, a reasonable consideration of the IUCN suggestion, and on the other, it is a value used by previous similar studies. For purposes of the Gap Analysis, data on the occurrence of species and habitats relevant for the biodiversity of the region – biodiversity targets - were collected. On the regional level, 157 biodiversity targets were identified [2].

3. Results and Discussion

The findings of an analysis of singular biodiversity targets for the Dinaric Arc Ecoregion are as following [2]. Targets are not fully covered in Slovenian PAs. Of a total of 85 targets identified in Slovenia, only 15 (17.6 %) were adequately covered with PAs, 68 (80.0 %) targets resulted as a gap and 2 (2.4 %) as a total gap. Gaps occur equally in all analyzed groups of targets.

Altogether, 133 targets were identified in Croatia. 78 targets (58.6 %) were covered, 52 (39.1 %) resulted as a gap and 3 (2.3 %) as a total gap. According to the results obtained, the system of terrestrial PAs of Croatia should be considered efficient for the protection of biodiversity. However, some important gaps were identified. According to the results, Croatia's PAs system adequately covers land at higher altitudes, while lowlands and hilly areas (between 0 and 600 m.a.s.l.) were not adequately covered with PAs. This is indicated also in the distribution of gaps that predominantly occur in lowland targets. Forests of the coastal areas (evergreen forests) and higher mountain areas are adequately covered, while those of lower hilly areas result in gaps. Karstic fields, which are widely distributed in the country and are of vital importance for biodiversity, are not adequately covered with PAs. Gaps were identified among reptile species, especially in those species occurring in the warmest lowland areas. Significant gaps were also identified in freshwater fish. The great majority of them are endemic to the region, and in most cases they were found to be inadequately covered with PAs.

In Montenegro, 109 targets were identified, of which 60 (55 %) resulted as a gap, while 15 (14 %) resulted as a total gap. 34 targets were found to be covered. In Montenegro, only 1,009.10 km2 of the land (6.20 %) is covered with PAs. Even though the majority of PAs occur in the lowlands, a great number of gaps also were found to be lowland targets. This is because the majority of PAs surface is represented by lakes which are not an adequate habitat for terrestrial targets and forests. Gaps are equally distributed in all groups of targets. Only high mountain targets were found to be relatively well covered with PAs. There are no marine PAs in Montenegro. It must be noted that Prokletije National Park in Montenegro was established at the time when analysis had already been undertaken and therefore it was not included, despite the fact that these PAs will significantly increase the extent of the total PAs in Montenegro.

Bosnia and Herzegovina was found to have the most significant number of gaps in the region. This is mainly due to the scarce surface area represented by PAs (1,082.93 km2 (2.63 %) of the area within the DAE). In total, 111 targets were identified in the country, of which 79 (71.2 %) resulted as a gap and 21 (18.9 %) as total gaps. Only 11 targets (9.9 %) can be considered covered. Gaps occur evenly in all

analyzed groups of targets. All marine targets are identified as gaps since there are no marine Pas.

3.1. Identification of priority gaps in Albania

According to the gap analysis report, in Albania, 97 targets were identified, of which 38 (39.2 %) were gaps and 5 (5 %) total gaps. 54 targets (55.6 %) were covered (Figure 1). 1279.13 km^2 (9.86 %) are covered with PAs. The analysis shows that 65 out of 97 total targets identified in Albania are important at regional level, meaning that their protection in Albanian is significant for the entire eco-region. (Table SI (Supplementary material). The great majority of PAs occur in the lowlands, therefore lowland targets were more adequately covered than targets of hilly areas and higher altitudes.

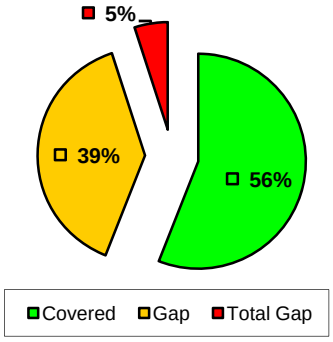

Figure 1. Biodiversity targets gap analysis in Albania

Considering the gap analysis report and the situation of nature conservation efforts in Albania, the most priority gaps form the ones identified can be summarized as following:

3.1.1. Marine areas

The protection of marine biodiversity remains a high priority gap for Albania. The establishment of the first marine protected area (Sazan-Karaburun Marine Protected Area) somehow tried to address this issue but it is still not enough. Three important marine biodiversity targets are identified as total gaps from the gap analysis including sea grass meadows, corridors for loggerheaded turtle and important areas for bottlenose dolphin.

3.1.2. Rivers and canyons

Rivers of Albania are not adequately represented within PAs, with respectively 171.78 km^2 (9.58 %) (Table 1). Also canyons are not well represented in PAs of Albania with only 24.37 km2 or 1.10 % covered by PA. The strategy for strengthening and enlarging the protected areas network in Albania [3] has also recognized the need for establishing new protected areas to include some of the most important river valleys (Drini valley or Vjosa valley).

Table 1. Albanian rivers under Protected Areas

PA category	Length of rivers in PAs (km)	% of river in PAs
II	76.51	4.27
IV	23.98	1.34
V	70.86	3.95
VI	0.42	0.02
Total	171.78	9.58

3.1.3. Cave biodiversity

The gap analysis has not identified this target as a gap for Albania since the total lack of data on cave biodiversity. However, the total lack of information makes this target a priority gap for Albania. Efforts should be made by the nature conservation authorities (MEFWA) as well as academic and research institutions to address the lack of information and studies on cave biodiversity in Albania.

Other important gaps include:

- High mountain lakes: the target is a total gap in Albania
- Forests of Heldreich's pine: In Albania it is a gap, since only 0.90 km2 (0.82 %) are covered within PAs.
- High mountain grasslands ('rudine'): The target is a gap in Albania, where 17,78 km2 (4.99 %) are represented within PAs.

4. Conclusions

The DAE still has a great deal to do to fill in the gap of information on biodiversity. The Gap Analysis shows that the quality, scale and detail of data on

biodiversity in the region must still be improved for an appropriate assessment of the biodiversity values in the area. There is a huge gap in available data for the region regarding the specific components of biodiversity, as well as those connected to the current and planned practice in land use. The lack of adequate data indicates that a great deal of effort must be involved in effective scientific studies, including accurate field inventories, for a full understanding of the biodiversity potential of the region. The lack of adequate data indicates that a great deal of effort must be involved in effective scientific studies, including accurate field inventories for a full understanding of the biodiversity potential of the region. This is particularly true for areas which have resulted in being biodiversity hotspots.

Furthermore, the methodology for making an inventory of biodiversity and the availability of specific data and precision and reliability of available data vary greatly between the countries in the project area. In the case of Croatia, more precise data were available, but since the Gap Analysis entrance data should have been uniform for the project area, those data were not used. The significant shortage of data and its low precision severely limited the choice of biodiversity targets, as well as representativeness of final results. On the other hand, in most of the countries where data, information and studies exist, they are not readily shared among different users. Sometimes researchers or institutions are reluctant to share their data and information which are considered to be valuable property.

The biodiversity targets related to forestry are the best described and studied in the area. All countries studied have good knowledge and data on forest-related biodiversity targets. The other terrestrial targets are not similarly considered in all the countries, and they are not covered by special studies. The modeling of these targets shows that they are important for the region and require specific studies (especially canyons, high mountain lakes, streams and rivers). Cave biodiversity has proven to be vitally important in the area, although the information and data about that is limited. In some countries it is not studied at all (Albania).

The list of species (including small mammals, reptiles, amphibians, birds, and fish) is too long and not all species are important or known for all the countries. The result of this is that data on this subject exists only on the international level (IUCN, IBA). In future studies it would be better to work on selected flag species.

The marine biodiversity is also a great challenge for the region. There are still too many studies needed to address the gap of information on marine biodiversity. The shortage of data related to marine ecosystems in the entire project area was most obviously visible.

Some of the biodiversity targets overlap and there is no clear division between them, which in the future will require a careful selection and discussion on biodiversity targets to be considered.

The analysis showed that the level of protected area designations in the DAE is not sufficient to ensure adequate biodiversity protection. The inadequate protection of biodiversity was found to be particularly evident in the corridors and connectivity between protected areas, which is evident from biodiversity gaps in the hotspot maps. In addition, Bosnia and Herzegovina, with its central role in connecting biodiversity values between the north and south of the DAE, is almost completely missing a system of protected areas with respective corridors. Transboundary protected areas, which are known to be important effective biodiversity conservation tools at the regional scale, have still not been efficiently established.

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