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A Perspective on Ecological Corridor for Maintaining Healthy Ecological Processes in the Caucasus

Cristian S. Montalvo Mancheno, Giorgi Nakhutsrishvili & Nugzar Zazanashvili

Abstract

Unless changes in the current "island spatial structure" of protected area systems are thought over, it is quite likely that protected areas will fail in fulfilling their objectives. This is because they will not be able to respond well just by themselves to threats such as a rapid change of climate, increment in habitat destruction and fragmentation due to population growth, etc. Hence, governments have committed not just to further increasing protected area territories but also to create networks of protected areas, which should be integrated into the wider landscape.

This approach to biodiversity conservation has been widely recognized by conservationists and scientists. Many approaches for planning and managing conservation of biodiversity at a regional and landscape levels have been developed to fulfill this recommendation (e.g., Natura 2000, Emerald Network, etc.); and corridors have been recognized as a key element in all of them. Nevertheless, use of corridors has been much contested, even among members of the same group who called for them. Hence, the purpose of this paper was to outline a perspective on ecological corridors based on current understanding on this conservation measure.

Its conceptualization was driven by the goal of developing a measure that could serve to conserve biodiversity patterns and processes in the Caucasus.

Keywords

Caucasus, protected areas, ecological corridors, landscape planning

Introduction

The Caucasus is distinguished by its uniqueness and high level of biodiversity. However, biodiversity of the Caucasus region is under strong human impact, which poses a threat not only to species but also to ecological processes. For example, tree line vegetation has been strongly degraded and lowered (at an average of 200–400 m.) in the Central part of the Greater Caucasus because of long-term overgrazing, tree cutting, etc. (NAKHUTSRISHVILI 1999). As a result, the Caucasus region was identified as one of the 34 Earth's biologically richest and most endangered biodiversity hotspots (ZAZANASHVILI et al. 2004).

There is a long tradition of nature conservation in the Caucasus. The first strict nature reserve in the region was created in 1912 in Lagodekhi gorge on the south-eastern slopes of the Greater Caucasus. Strict protection was the approach used during Soviet time. For instance, after the collapse of the Soviet Union the protected areas system of Georgia consisted poorly of 15 strict nature reserves, which covered 2.4 per cent of the country. Fortunately and thanks to support from international organization (e.g., World Wildlife Fund - WWF and German Bank for Reconstruction and Development - KfW), more comprehensive protected area systems have been developing in the countries of the Caucasus.

In the Caucasus, conservation efforts have been driven by the Ecological Conservation Plan since 2001. This strategic document recognized the importance of establishing ecological networks to ensure the conservation of Caucasus' biodiversity. Its development has primarily focused on ensuring that high valuable biodiversity areas are well conserved by improving the management of existing protected areas (PAs), setting aside new PAs and restoring deteriorated habitats (MONTALVO MANCHENO 2012). Although the implementation of these activities has been successful for the past 12 years and has also considered more urgent and complex conservation issues (e.g., developing a strategic document for responding to impacts of global climate change on forests in the Southern Caucasus (ZAZANASHVILI et al. 2011)), all components of an ecological network still need to be thought through for the Caucasus. Hence, ecological corridor has been put forward as the next conservation measure that needs to be developed.

A perspective on ecological corridor for the Caucasus

Driven by the goal of developing a conservation measure that will help conserve biodiversity patterns and processes, we believe that the purpose of ecological corridors for the Caucasus must be to maintain or increase connectivity. In order to achieve this, planning and design of ecological corridors must be at a landscape level and considered the different structural components of an ecological network.

When thinking about connectivity, we concur with KROSBY et al. (2010) that it refers to management actions that facilitate or enhance the flow of organisms and ecological processes. Based on this understanding, we assume that connectivity is an attribute of an entire landscape that is influence by the spatial arrangement of different physical elements and the features associated with their layout in a landscape, and by the behavioral responses of species and processes to those elements in the landscape (i.e., structural component and functional component, respectively). Although both definitions are the main functional aspects of the landscapes (JONGMAN et al. 2004), it does not necessarily mean that conserving structural connectivity ensures functional connectivity (TISCHENDORF & FAHRIG 2000). Nevertheless, we agree with CHETKIEWICZ et al. (2006) that using biodiversity patterns as surrogates for biodiversity processes seems like a reasonable mapping approach to design a suitable conservation measure (i.e., ecological corridor) in an area where uncertainty exists.

In the Caucasus, a regional approach was firstly used to identify important areas where urgent conservation actions are needed. Nevertheless, conservation efforts have reached a tipping point where more detailed information is necessary to ensure persistence of biodiversity (MONTALVO MANCHENO 2012). Consequently, landscape has been thought of as the scale for developing ecological corridors.

Landscape was selected as planning level because it represents a kilometers-wide cluster of repeated spatial elements (i.e., a mosaic)–including local ecosystems and land uses–that manifests an ecological unity (FORMAN 1995). As a mosaic, our perspective on ecological corridor goes away from the artificial dichotomy of habitat and non-habitat (CHETKIEWICZ et al. 2006; MCINTYRE & HOBBS 1999). Instead, planning of ecological corridors is perceived as a spectrum of habitats occupied by organism and where ecological processes can persist. This perception is supported by FISCHER & LINDENMAYER (2007), who stated that even though landscape connectivity is a human perception of connectedness, it might translate into habitat connectivity, and it tends to positively facilitate some ecological processes. Movement–not restricted to animals but extended to processes (e.g., pollination)–also happens in a mosaic of habitats with different levels of suitability (MCINTYRE & BARRETT 1992). Therefore, we agree with MCINTYRE & HOBBS (1999) that a particular landscape should be analyzed along a continuum of its alteration, in which destruction defines the state of landscape and modification describes the state of lasting habitat.

All the discussed above about the purpose of ecological corridors and the landscape planning approach needed shows that our perspective on ecological corridors for the Caucasus have to include the habitat function in addition to the movement function, as argued by BERGÉS et al. (2011). In addition, this constant shifting mosaic of habitats with varying suitability will require a range of management actions. Hence, to keep a guiding picture when planning ecological corridors, we adopt the structural configuration of ecological networks proposed by BENNETT & JO MULONGOY (2006) (i.e., core areas, different types of connectivity mechanisms, buffer zones, and sustainable-use areas) but add rehabilitation areas, as another management action to be considered.

Because in our perspective on ecological corridors host a varying degree of human use related to biodiversity, which in turn affects biodiversity patterns and processes (HANSEN & DEFRIES 2007; MCINTYRE & HOBBS 1999), we agree with VAN DER WINDT & SWART (2008) that the so-called social robustness comes to play an important role when planning and designing large-scale conservation measures. Therefore, socio-economic and land-use pattern analyses have to be carried out in the whole extend of any ecological corridor to ensure that efforts to conserve biodiversity patterns and processes does not compete with but supports local population needs and desires.

Discussion and Conclusion

Even a hard preservation such as Aldo Leopold recognized that the sole action of keeping PAs free of development is not enough for achieving conservation of biodiversity. In the Caucasus, PAs has significantly increased since 2001, which concur with KROSBY et al. (2010) recommendation that establishing and strengthening PAs should be the first conservation action before developing large-scale efforts to maintain or increase landscape connectivity. Moreover, decision and policy makers from the Caucasus perceive that there is no more space for setting aside new territories under legal protection. Hence, in our perspective on ecological corridors we have embraced that it is not and will not be possible to set aside new PAs for all natural lands.

Based on this understanding, efforts and resources have to be allocated to maintain least modified habitat (i.e., existing natural corridors) rather than to restore degraded territories (BERGÉS et al. 2011; MCINTYRE & HOBBS 1999). This approach could be applied in the Caucasus because although the forming Soviet planning system has contributed to the serve degradation of certain areas in Eastern Europe, it has at the same time helped conserve others (JONGMAN et al. 2004).

The success of our perspective on ecological corridors, as for any large-scale conservation effort, has to do a lot with its implementation. This implies to carry out a processes where the whole spectrum of stakeholders (i.e., from policy makers at national levels to local farmers) are actively involved. We believe that this can be achieved in the region, because the transitional process facing Eastern European countries has not just resulted in challenges, but also in opportunities for changes within states' functioning at the economic, institutional, legislative and administrative levels (JONGMAN et al. 2004).

Even in a complete favorable environment, implementation needs a logic structure. Hence, when implementing ecological corridors, it will be essential to frame the whole process. There exists various theoretical frameworks, but based on the success in a similar topic and biome there are two that stand out: Ecological Sustainable Land Management (KNIGHT & COWLING 2003) and Adaptive Collaborative Management (PRABHU et al. 2007). Likewise, there is an ongoing work, leaded by IUCN Environmental Law Centre and Global Programme on Protected Areas, for advancing connectivity conservation through law; and therefore, their lessons learned and expertise should be

kept in mind when seeking to incorporate ecological corridor and connectivity conservation into the legislation of the countries in the Caucasus region

We believe that acknowledging shortcomings/limitations of our perspective on ecological corridors is also important, because it will help us keep in mind that there is space for improvement. In other words, we acknowledge that our perspective is not the final answer to long-term conservation of biodiversity in the Caucasus or anywhere else.

Like similar conservation measures, our perspective will not be able to encompass all ecological processes functioning in the pilot area because its limits are based on a human perception of unity (i.e., landscape). Lack of information will become an important barrier to overcome in the Caucasus. Information for all species does not exist, and for those species that information does exist, mainly large mammals and some threatened species, either its reliability is questionable (e.g., species distribution points) or it is outdated (e.g., pasture conditions). There are no studies on the biological and evolutionary processes in the pilot area or even for the Caucasus region. Likewise, land-use patterns and socio-economic data are outdated and even in some cases hard to access due to bureaucratic procedures. These constraints highlight the importance of having a truly participatory process for designing and setting on the ground ecological corridors in the Caucasus.

For us, an ecological corridor is not just a measure that can help ensure persistence of biodiversity, which has been acknowledged as an important aspect for achieving long-term conservation and has proved to be even more challenging under any climate change scenery, but also a strategy that could help balance the need between natural resource use and conservation. The challenge will be to keep ecosystems' rates, scales and intensities of change within historic ranges in a world increasingly dominated by human activities. Our perspective is the first attempt of such effort in the Caucasus. Therefore, our perspective on ecological corridors needs to be piloted, and like similar conservation measures implemented in other parts of the world it will have to be evaluated during and after implementation. This will allow us to gain insight on the planning process for developing similar conservation measure in the Caucasus region, primarily, but maybe also be useful for other regions.

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Contact

Cristian S. Montalvo Mancheno[1, 2]
cmontalvo@wwfcaucasus.org

Giorgi Nakhutsrishvili[1]
nakgeorg@gmail.com

Nugzar Zazanashvili[1, 2]
nzazanashvili@wwfcaucasus.org

[1] Ilia State University
Kakutsa Cholokashvili Ave 3/5
Tbilisi 0162
Georgia

[2] WWF-Caucasus Programme Office
Aleksidze St. 11
Tbilisi 0193
Georgia