Main Threats to Mountain Biodiversity in Georgia

George Nakhutsrishvili, Maia Akhalkatsi and Otar Abdaladze

The Caucasus mountain system was formed ca. 28.5–23.8 million years ago as the result of a tectonic plate collision between the Arabian plate moving northward and the Eurasian plate. It is made up of two separate mountain systems: the Greater Caucasus mountain range lying north-west to east-southeast between the Black Sea and Caspian Sea; and the Lesser Caucasus Mountains, which run parallel to the greater range, at a distance averaging about 100 kilometres south. Georgian territory (69,700 kilometres^2) covers both mountain ranges between 40° and 47° latitude east, and 42° and 44° longitude north. Two thirds of the country is mountainous with an average height of 1,200 m.a.s.l., with highest peaks of Mount Shkhara (5,184 m.a.s.l.) at the Western Greater Caucasus and Mount Didi Abuli (3,301 m.a.s.l.) in the Lesser Caucasus.

Figure 1: Erosion and settlement. Photo: Maia Akhalkatsi.

The territory of modern-day Georgia has been continuously inhabited since the early Stone Age and affected by human communities for tens of thousands of years. On average, nearly half of the land in the region is already transformed by human activities. Nevertheless, several pristine areas remain in the hotspot, mostly in remote high-altitude areas and inaccessible gorges. About 12 percent of the original vegetation is considered pristine (National Biodiversity Action Plan, Georgia 2005). Most of the hotspot's intact ecosystems are concentrated in high mountain sites, while the plains and the foothills have suffered the most habitat loss. Therefore, urgent steps should be undertaken to protect remaining biodiversity in the area.

The two main problems threatening Georgia's mountain biodiversity in the modern age are anthropogenic impact and global climate change. Traditional agriculture in Georgia in the past was sustainable and did not seriously threaten biodiversity in Georgia. The main impact was generated in the Soviet period, when Georgian agriculture supplied by-products such as wine, vegetables, wool and cheese to Russia and other Soviet republics. This caused an increase in sheep and cattle herds up to several million heads on the relatively small territory of the country. While still shepherded in the traditional way, the herds became so large and rotations became too short, so that they threatened many high mountain pastures and caused soil erosion (Figure 1). This problem reduced after the disintegration of the USSR in the early 1990s, when Georgia became responsible mainly for production of agricultural products for its own market.

Nevertheless, the social and economic crises that have plagued the region since 1992 have caused other problems which nowadays are leading to habitat losses in the mountain areas in Georgia. Problems include the migration of population, especially youth, away from mountain regions, with abandonment of mountain settlements due to unemployment, bad roads, and the absence of communication and social comfort. There is a low quality of life for mountain people, as well as absence of factories for processing agricultural products and sellers' markets. There are natural threats to the population, roads and land in the form of avalanches, mountain torrents, landslides and floods. Lack of investment to improve disturbed slopes and the absence of sustainable management to improve life in the high mountain regions also causes problems. The lack of lowland winter pastures for sheep in the northern (Russian) foothills of the Great Caucasus has also led to a shift in the husbandry system away from sheep to heavier cattle, often not suitable for the steep and fragile slopes and adding to the risk of soil degradation and erosion.

It is necessary to improve the way of life of the local population and invest more funds in recovery projects for nature protection measures in mountain ecosystems. Progress in the mountain regions of the Caucasus might be reached by an improvement in the development of small power industries, fresh water supplies, use of mineral springs, production of ecologically clean products by local farmers, development of aesthetic resources and historical heritage for the development of mountain tourism, gastro-, agro-, ethno- and scientific-tourism, weekend tourism and development of hotel businesses. As a first step, detailed scientific investigations should be undertaken to develop an appropriate approach for a particular geographic region.

Figure 2: Overgrazed slope. Photo: Maia Akhalkatsi.

The central scientific focus should be on how fundamental processes in plant communities might alter, given current predictions for the response of alpine vegetation to global warming. Ongoing climatic changes cause lower-elevation habitats to expand into higher elevation zones, with alpine meadows and pastures often becoming encroached by shrubs and trees (Gottfried et al., 1998). Changes in climate also affect the depth of winter snowpack exposing sensitive taxa to harsh climate episodes. What is most important is treeline ecotone, representing the most sensitive ecosystem regulating mountain hydrology and the stability of mountain slopes with respect to soil erosion, avalanches and landslides. Sustainable life in mountains is largely dependent on slope stability (Figure 2). Vegetation plays a key role in stabilisation of soil on the steep slopes to avoid landslides and soil erosion (Körner, 2002). Heavy overgrazing, which took place in Georgia in the last century, caused massive destruction of many alpine meadows and pastures, impacting steep slopes in particular. To restore these disturbed areas, vegetation needs to recover. Special attention should be paid to the complex processes that determine structure and functionality of alpine ecosystems. Because of similarities in alpine regions globally, scientists from different countries should cooperate in order to compare studies from various alpine systems, share expertise and organise mutual activities. The expertise in different fields of a science gives good opportunities for the development of interdisciplinary research projects.

To develop the status of an effective methodology for the restoration of the environment and protection of mountain biodiversity, it is necessary to know biological indicators of degradation and to know which species are key to secure slopes. Once these species are identified, their future in a changing climate need to be assessed using the environmental envelope approach. It will thus be possible to rank species by both their slope protection function as well as their risk under climatic change scenarios. A joint project with the Institute of Botany in Basel, in the framework of the GMBA Research Agenda on Land Use Change and Mountain Biodiversity, is tackling these questions (funded by SCOPES-SNF, project 110670).

References

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George Nakhutsrishvili *botanins@yahoo.com*, Maia Akhalkatsi *akhalkatsim@yahoo.com* and Otar Abdaladze *otarabdaladze@yahoo.com* are members of GMBA and are at the Ilia Chavchavadze State University, Tbilisi Botanical Garden and Institute of Botany, Tbilisi, Georgia.