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Forest Landscapes and IUCN Red List Species in the Communities of Lower Racha

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Abstract

Mountain forest landscapes are important storages of biological diversity, upon which heavily depend local communities, to receive ecosystem services that are fundamental for living, including fuel, food, and clean water. Mountain forests also provide environmental goods and services such as carbon storage and non-wood forest products. Ecosystem services are the benefits people obtain from ecosystems, and their change influence human well-being. Fragile vegetation cover makes mountain areas vulnerable to environmental degradation. Mountain landscapes are amongst the most vulnerable areas to climate change. Georgia is amongst the fifteen most mountainous countries of the world, where climate change and natural hazards are causes of environmental degradation. Communities of the Central Caucasus largely depend on the services provided by the forest ecosystems. Our study area, Lower Racha, is part of the Caucasus ecoregion. The Caucasus is also recognized as one of the biodiversity hotspots of the world out of twenty-five. Some dominant tree species of Lower Racha are incorporated into the data of the IUCN Red List of Threatened Species. Even though the natural forest cover is still present in the study area, there are climate-driven problems of forest land degradation and also overlapped land-use interests, which require the application of the holistic approach in nature conservation and community development. In line with this, the maps of forest types and forest species by communities, which are represented in the paper, can be useful instruments and additional sources of information for strategic decision making.

*Keywords:*Forest landscapes; Tree species; Lower Racha

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Introduction

Mountains are repositories of biological diversity, also an important source of forest and agricultural products, and recreation (UN, 1992). Much of the mountain biodiversity is in the forests, upon which heavily depend people of communities, to receive services fundamental for living, including fuel, food, clean water, and protection from natural hazards (Price et al., 2011). Mountain forests also provide environmental goods and services such as carbon storage and non-wood forest products. Fragile vegetation cover makes mountain areas vulnerable to environmental degradation (Veith and Shaw, 2011). There are many pieces of evidence from all over the world showing that "most global mountain areas are experiencing environmental degradation" (Agenda 21), leading to the degradation of services they provide. Ecosystem services are the benefits people obtain from ecosystems, and their change influence human well-being. People are integral parts of ecosystems and that a dynamic interaction exists between them and other parts of ecosystems (MEA, 2005). There is an urgent need to create a sustainable livelihood for mountain people who depend on ecosystems and promote sustainable use of natural resources and ecosystems (UNGA, 2012).

Mountainous landscapes are amongst the most vulnerable areas to climate change (Khardziani et al., 2017). Georgia is amongst the fifteen most mountainous countries of the world (Khardziani, 2019), where climate change and natural hazards are causes of environmental degradation (Elizbarashvili et al., 2018). Communities of the Central Caucasus largely depend on the services provided by the forest ecosystems (Khardziani et al., 2018). Middle altitude forest landscapes are less transformed in the region (Maisuradze et al., 2018)**,** making bases for favorable rural livelihood and recreation. It should also be noted that the area is rich with biodiversity, calling urgency for conservation.

Our study area, Lower Racha (Ambrolauri municipality), is part of the Caucasus ecoregion, with "outstanding biodiversity, containing a distinct assemblage of natural communities and species" (Olson et al., 2001). The Caucasus is also recognized as one of the biodiversity hotspots of the world out of twenty-five, as an area with exceptional concentrations of endemic species and experiencing exceptional loss of habitat. The ecoregion is the home to 6,300 plant species, with 1,600 endemic plants (Myers et al., 2000). Some dominant tree species of Lower Racha are incorporated into the data of the IUCN Red List of Threatened Species. The IUCN Red List is the accepted standard for species global extinction risk (Hoffmann et al., 2008).

Despite the fact, that the natural forest cover is present in the study area (Ketskhoveli, 1959; Salukvadze et al., 2017), there are climate-driven problems of forest land degradation and overlapped land-use interests, which require the application of the holistic approach in nature conservation and community development. In this regard, the maps of forest types and forest species by communities can be useful instruments and additional sources of information for strategic decision making.

Materials and Methods

Our study implied field trips, landscape mapping, GIS mapping, and analysis. The basic material, for the forest data mapping and calculations, was the polygon layer depicting landscape plots, with relevant attribute tables in feature class format. A landscape base map was then used for the identification of the forest types. The maps represented in the article were compiled using the program ArcGIS. The IUCN red list species distribution map (Fig 3.), which is represented as point layer, was also created by converting the landscape polygon layer into the point feature class. Thus, the points on the map represent the central points of the polygons of the landscape layer. Main expeditions were conducted between 2000 and 2012, while the last field trip for the data verification occurred in summer 2019.

Results and Discussions

More than 60% of the Ambrolauri municipality is covered by forest landscapes. Broadleaf forests are the dominant forest type (Fig 1.). It is followed by the mixed forest category at the second place. Then come dark coniferous forests in the third place by area, which are followed by subalpine forests. Light coniferous forests cover the smallest area within the study region.

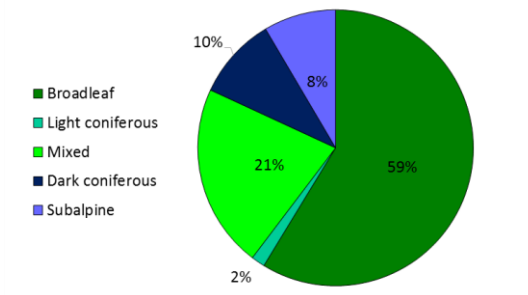

Fig.1. Forest types of Ambrolauri municipality.

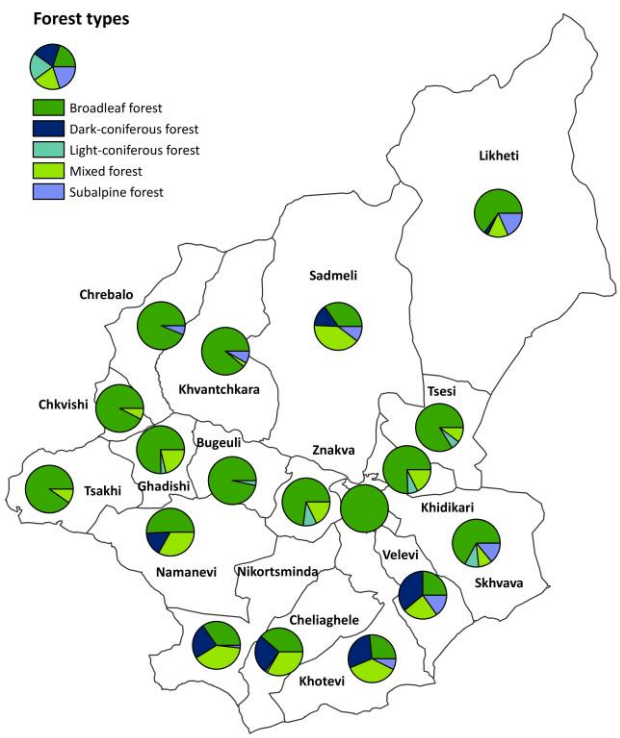

Fig.2. Forest types by communities of the Ambrolauri municipality.

It should be noted that the spatial variation of forest types is not uniform across the communities (Fig 2.). The broadleaf forests are predominantly distributed in the communities, which are located close to Lower Racha Valley. These include Bugeuli, Chrebalo, Chkvishi, Khvanchkara, Tsakhi, Ghadishi, Znakva, Tsesi, Skhvava and the area of Town Ambrolauri itself. Dark coniferous forests are found in Namanevi, Nikortsminda, Cheliaghele, Khotevi, Velevi, Sadmeli and a small portion in the Likheti Community as well. Light coniferous forests can be found in Skhvava, Znakva, Khidikari, Tsesi, also in Bugeuli and Ghadishi communities. Many of these forests are artificial and are composed of pine trees. Mixed forests cover a large area in Sadmeli, Khotevi, Cheliaghele, Nikortsminda, Namanevi, and Velevi communities. They are also distributed in Skhvava, Khidikari, Tsesi, Likheti, Znakva, Ghadishi, Tsakhi, Chkvishi, and Khvantchkara. Subalpine forests are found in seven communities out of nineteen. These include Likheti, Sadmeli, Khvanchkara, Chrebalo, Skhvava, Velevi and Khotevi.

Besides large natural forest cover, communities differ from each other by the share of forest resources (Table 1). Likheti, Sadmeli, and Namanevi are the three largest communities by forest cover within the municipality, while Itsa, Chkvishi, and Khidikari own the smallest number of forest areas.

Table 1. Forest area and composition of the Ambrolauri municipality by communities.

Communities	Location	Forest area (ha)	Dominant forest species
Likheti	42°36'25.23"N 43°14'8.04"E	15616.8	*Fagus, Quercus, Betula-Acer*
Sadmeli	42°32'43.06"N 43° 6'41.14"E	13486.5	*Fagus, Abies-Picea*
Namanevi	42°29'7.41"N 42°58'47.51"E	6437.5	*Fagus, Carpinus, Abies-Picea*
Skhvava	42°30'7.04"N 43°13'58.52"E	5743.0	*Quercus, Fagus*
Khvanchkara	42°33'40.05"N 43° 1'21.50"E	5486.4	*Fagus, Quercus, Carpinus*
Khotevi	42°27'58.40"N 43° 7'52.76"E	5218.8	*Fagus, Abies-Picea, Quercus*
Nikortsminda	42°27'30.71"N 43° 5'35.49"E	4457.7	*Fagus, Picea-Abies, Carpinus*
Tsakhi	42°31'6.09"N 42°54'21.09"E	3637.8	*Quercus, Carpinus*
Tsesi	42°32'35.11"N 43°11'58.60"E	3551.6	*Quercus, Fagus*
Chrebalo	42°35'14.48"N 42°56'57.86"E	3263.3	*Fagus, Quercus*
Velevi	42°27'37.43"N 43°10'41.80"E	2433.0	*Quercus, Abies-Picea*
Cheliaghele	42°27'9.04"N 43° 5'57.40"E	1769.7	*Quercus, Abies-picea, Fagus*
Znakva	42°30'46.91"N 43° 4'47.39"E	1471.2	*Quercus, Fagus*

Ghadishi	42°32'46.09"N 42°59'17.82"E	1408.6	*Quercus, Carpinus, Buxus*
Bugeuli	42°32'23.80"N 43° 3'23.83"E	1340.1	*Quercus, Carpinus*
Khidikari	42°31'34.85"N 43°11'11.54"E	895.2	*Quercus, Carpinus*
Chkvishi	42°34'38.05"N 42°55'41.32"E	600.2	*Quercus, Carpinus*
Itsa	42°30'43.67"N 43° 8'31.51"E	590.1	*Quercus, Fagus, Carpinus*

Lower Racha forest composition is diverse, although there are some three species, which are found frequently in most of the communities. Many of the species one can find in the municipality are also listed in the IUCN red list (Fig 3.).

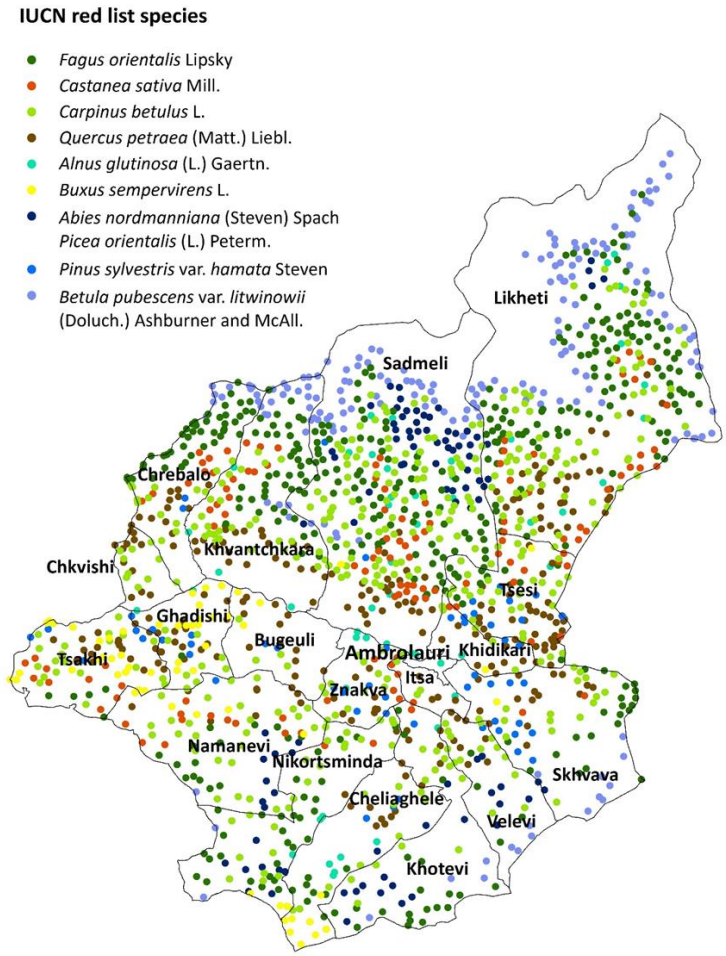

Fig.3. Spatial distribution of the IUCN red list species in Lower Racha.

The dominant species of the Lower Racha are as follows: oriental beech (Fagus), common chestnut (Castanea), hornbeam (Carpinus), oak (Quercus), alder (Alnus), box tree (Buxus), oriental spruce (Picea), Caucasian fir (Abies), scots pine (Pinus), birch (Betula) and Mountain Maple (Acer).

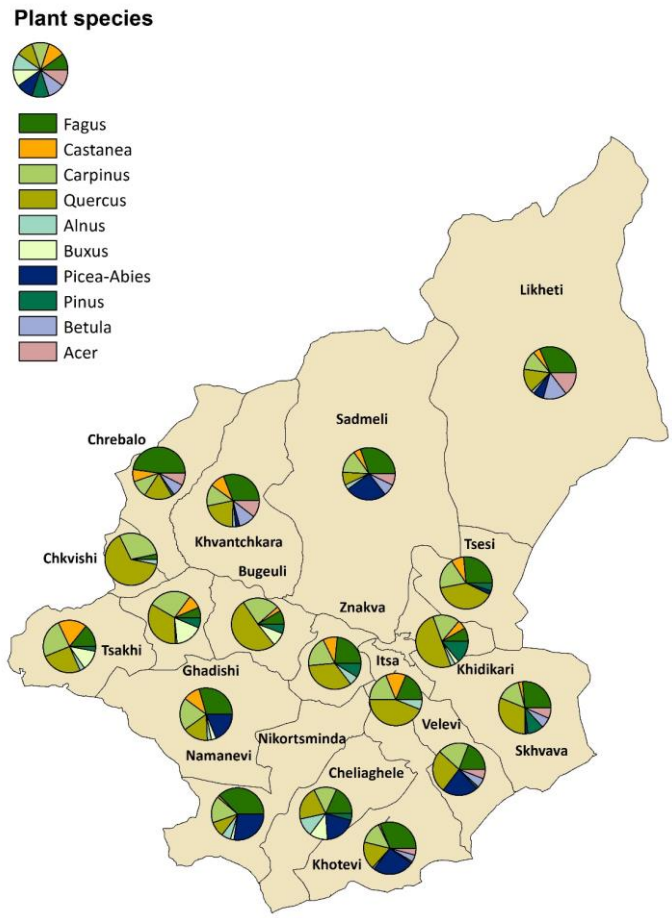

Fig.4. Forest species distribution by communities in the Ambrolauri municipality.

There are some differences among the communities in species composition as well (Fig 4.). An oak tree is dominant within eleven communities, while the beech is in the first place in seven communities. Six communities are characterized by a large number of spruce and fir trees. Box tree is co-dominant only in the Ghadishi community. Birch and maple are found in large numbers in the Likheti community. Middle mountain natural forests are still preserved because of the harsh terrain and low accessibility. Forest cenosis are quite diverse here, basically because of tree and shrub species diversity (Ketskhoveli, 1959). Dominant species of the Lower Racha are beech, oak and hornbeam trees. Beech forest has high environmental protection function. They are mostly replaced by secondary hornbeam forests (Kvachakidze, 2014). Oak forest is also being secondary in many parts of the study area. In this zone, oak trees were developed following the transformation of hornbeam forest areas (Ketskhoveli, 1959).

Conclusions

More than one-third of the Lower Racha (Ambrolauri municipality) is covered by forests. The most widespread forest type is a broadleaf forest. Among the tree species, oak and beech trees are found most frequently. Among the tree species, oak and beech trees are found most frequently. Hornbeam is also a common tree here. It is believed that oak and hornbeam forests are secondary in this specific area. The Likheti and Sadmeli communities own the largest forest areas, while Itsa and Chkvishi communities have the least forest land. Many of the tree species of the Lower Racha are enlisted in the IUCN red list species database. Thus, the forest area is subject to conservation as well as for the livelihood of the local communities. Therefore, during the planning and development, both biodiversity conservation and the interests of local people should be taken into account.

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