

THE INVENTORY OF FISH FROM THE NATIONAL PARK CĂLIMANI- PRESSURES, THREATS AND MANAGEMENT DIRECTIONS

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Abstract

To preserve and improve the conservation status of waters and fish species from Călimani National Park, in the field trips conducted in 2013 year were identified present anthropogenic pressures and potential anthropogenic threats that may occur in the near future. For each pressure/threat, which was identified according to a classification developed in this purpose, was made a description of pressure/threat by specifying its location and its intensity, establish a justification for the identified problems. Management measures proposed for identified pressures and threats involve mainly the authorities for park, forest and water but also the other stakeholders such as local and international NGOs, academics, local resource users and residents. To ensure the coherence and efficient management of protected area is an important aim, for this purpose we recommend to apply RAPPAM for the implementation of the future Management Plan of National Park Călimani.

Keywords: alpin region, biodiversity, measures.

1. INTRODUCTION

Administration of National Park Călimani

The current objective of nature conservation is to protect species along with their ecosystems. Today we are not talking about "species conservation", but about "protecting / preserving species and their habitats". At the same time, talks about perpetuation of species are reopened, this natural process can be, and sometimes must be, supported by man (Munteanu, 2010). The magnitude and intensity of human activity became comparable only with the great geological forces that transformed the face of the earth (Botnariuc, 2010).

The National Strategy for the Conservation of Biological Diversity aims firstly to ensure the coherence and efficient management of the national network of protected natural areas (UNDP - GEF, 2010). At present, over 80% of romanian national and natural parks are managed by Romsilva, a self-financing company. Protected areas can not be financially self-sustaining and even if conditions for income generation are created, the income achieved should be forward to the local economy and only a small percentage be forward to area management (Coalitia Natura 2000 Romania, 2010).

The Calimani Mountains are mountains of volcanic origin with large slopes with extremely varied and crafted relief, with volcanic aggregations. Having human settlements only in the Mures defile, the area was not significantly altered by the anthropic activity and the natural diversity of the

habitats and species was preserved. The Administration of Calimani National Park (APNC) was established as a unit with legal personality in 2009 and APNC is part of the structure of the Romsilva, National Forestry Administration (RNP). APNC develops the management plan and the regulation of the protected area, implements and/or coordinates the actions related to the management of the park, while having the attributions of control and approval of all activities within its scope (RNP-APNC, 2015a). The surface of the park, registered in the Law no.5 / 2000, is 24041.00 ha and the result from the GIS processing of the annexed map to the Government Decision no.230/2003, is 24556 ha (RNP-APNC, 2015b). The administrative units affiliated to National Park Călimani are made up of 25 communes, Toplita municipality and Vatra Dornei municipality, spread over the area of 4 counties. (RNP-APNC, 2015c).

The National Park Călimani corresponds to II category (National Park) of the International Union for the Conservation of Nature (IUCN) and is included in the site of community importance ROSCI0019 Călimani-Gurghiu, declared in 2007 as an integral part of the European ecological network Natura 2000 in Romania (RNP-APNC, 2015d).

The main difficulty with which the Administration of National Park Calimani faced in the first years of managing the conservation of the natural heritage was the lack of information. At present, the administration benefits from the biodiversity assessment studies carried out by the POS Environment Programm during the period 2013-2014 for the species and habitats of community interest, but the studies carried out must be continued in the following periods in order to verify the effectiveness of the management measures.

2. MATERIALS AND METHODS

Current imbalances in protected areas are mainly generated by human activities that can significantly change the conditions necessary to maintain a proper state of natural, cultural and spiritual values. These human activities can be aggravated by natural phenomena such as geological events, climate change and extreme weather phenomena.

As a result, for the fish species and their habitats from the National Park Călimani, during the period 2013-2014 was proceeded to the assessment of the current pressures and future threats by completing the following information:

- Name of Pressure / Threat
- Description of Pressure / Threat
- Location Pressure / Threat
- Intensity Pressure / Threat
- Relevant details for describing the effects of pressure / threat on fish
- Recommended management

3. RESULTS AND DISCUSSIONS

A reality of contemporary societies is the diversification of environmental conflicts, directly related to the multiplication and intensification of human pressure on the environment. The occurrence of environmental conflicts at local, regional and global levels require a increasingly diversified approaches both at assessment and at legislation level to mitigate their effects or to cancel them. The size, characteristics and features of environmental conflicts vary across economic systems and levels of perception of the actors involved. Better knowledge of conflicts, generated by the incompatibilities between different ways of using resources, can lead to an improvement in the quality of the environment (Ioja et al., 2015).

Environmental conflicts are based on a number of triggering factors which are part of the category of pressures and threats. Pressures are current activities or events that have a direct negative effect on biodiversity. Threats are potential or imminent pressures with a negative impact at present or in the future. Pressures and threats can be hierarchized as high, medium, low, not applicable level. The assessment of pressures and threats plays a critical role in the planning and management of biodiversity conservation (Stanciu, 2013). The identification and the evaluation of threats directed on biodiversity and values of protected areas are important for defining conservation objectives and management measures and actions. Having a complex database (scientific, administrative, socio-economic), IUCN has developed a general conservation framework for protected areas, identifying a range of options for generic actions that can be taken to eliminate and reduce threats to biodiversity (Papp et al., 2013).

Thus, knowing the pressures and threats at the National Park Călimani can lead to better management of these for the benefit of nature and man. With regard to fish, we have identified and described a series of current pressures and future threats that may trigger conflicts in maintaining the integrity of water and fish in the park's territory.

Forest exploitation without replanting or natural restoration (B03)

The forests is managed by forestry administration and according to their regulations and to the legislation in force, only 39% of the wooded area is destined for cutting. The attitude of the forestry administration towards the park lands favored the preservation of the forest conservation status in some areas, and in others, initiated of ecological rehabilitation measures. After 1990, the socio-economic conditions and the restitution of some forest lands have led to a change in the attitude of the landowners/users, thus the pressure on natural resources rising significantly. Uncontrolled, ilegal cuts have led to the extension of damaged areas as a result of tree extraction, flora and fauna destruction, wood waste disposal and not only (RNP-APNC, 2015d).

Location and intensity of B03 pressure on fish:

- Haita brook with its tributaries (Paltinis, Tanau, Tarnita, Panacu, Rosu) - *High (H)*
- Especially on the abrupt slopes with forest exploitation - *High (H)*



Figure 1. Aspects of present pressure B03

The deforestation that take place inside the park on the abrupt side that surround the water courses have a direct influence on the fish and an indirect influence on the aquatic habitat and implicitly on the fish species that populate these habitats.

Due to the crossing activities that take place over the water courses with the specific machinery and equipment, due to the operations of crawling along the banks, it is inevitable that the riverbed and

banks of the rivers will be inevitably degraded.

Also, the storage of wood material (branches, shrubs) in the riparian areas can lead, where the slope of the land is high, to bringing it to the riverbed of brooks. The heavy rains, the melting of snow on the abrupt slopes, uncovered because of the forest cuts, bring both mineral material (earth, sands, gravel, boulder) and organic material (foliage, branches, necromancy). These materials cover the riverbed and constitute both an obstacle to the movement of fish and a carpet that covers and asphyxiates benthic life, acting directly on fish eggs and larvae, but also on other benthic organisms which is food for fish juveniles and fish adults.

Removal of dry or dried trees (B02.04)

The works adjacent to the forest exploits make their presence felt in most of the National Park Călimani. These works, which involve the removal of dry branches and their storage on the shores of the water, are difficult to achieve due to the topography of the land due to the steep slopes, due to the narrower valleys found mostly in the eastern part of the park.

Location and intensity of B02.04 pressure on fish:

- Haita brook with its tributaries (Paltinis, Tanau, Tarnita, Panacu, Rosu) - *High (H)*
- Tihu brook - *Medium (M)*
- Tihulet brook - *Medium (M)*



Figure 3. Aspects of present pressure B02.04

Wood deposits on the banks of the watercourses, or worse even in the watercourse, can cause obstructions, drifts of water flow, especially in times of flood, when the waters carry the row materials that deposit and form real barriers in the way of moving fish. The indigenous trout (*Salmo trutta fario*) is a fish that manifests the migration phenomena during the breeding period, requiring free travel routes. Also, due to the territoriality phenomena, the indigenous trout, which seems to be the only species presence on the territory of the park, does not bear large densities per unit of length, so that the density observed on the creek populated with the trout is one trout for 5-10 m length of the watercourse. Therefore, ensuring the pathways along the watercourses is essential for an optimal distribution of adults and the acces to the optimal habitats which ensure the requirements of optimum water volume, optimal oxygenation and optimal feeding.

Diffuse pollution of surface water caused by abandoned industrial platforms (H01.07)

The perimeter of the former sulfur extraction career, with 319 ha, further exerts pressure on the waters that have the receiving basin in the mining area. Even though the mine is currently closed, the exploitation activities have been completed since 1997, the area is heavily affected by the action taken over 30 years ago. In the area of the former mining activities there is the problem of soil pollution, of the waters pollution, but also of the destruction of vegetation in important areas. The mining waste are spread over 180 to 200 hectares, this area is heavily damaged, eroded, polluted,

infertile, largely deforested, form a altered landscapes. The waters that flow from this area are devoid of life. The Neagra Șarului River has contributed to the dispersion of pollutants leading to the degradation of the habitats from the Șarului Depression. As shown in the pictures below, the forest vegetation is dry.

Location and intensity of H01.07 pressure on fish:

- Neagra Șarului brook with its tributaries - *High (H)*



Figure 4. Aspects of present pressure H01.07

The Neagra Șarului River receives numerous tributaries that come from the perimeter of the former mining exploitation, so that the water course is most affected by residues, being polluted over its entire length and are devoid of life even starting from the springs. He springs from Voievodeasa, from the height of 1700 m and has a very branched basin, with many tributaries.

The tributaries that spring from below the highest peaks which surrounding the great mining crater and finally flow into the Neagra Șarului River, upstream of Gura Haitii are: Retiș, Pietricelul, Dumitreleul, Tarnița, Paltinul, Harla, Băuca, Tiganului brook, Haitii brook. The Neagra Șarului River then crosses the Șarului Depression and here gathers the rivers that come from the slopes, discharge their waters in Bistrita river, near the municipality of Vatra Dornei.

Due to the fact that the Neagra Șarului River is polluted with sulphurous waters and therefore does not allow the installation of fish populations, it acts as a barrier to the migration of fish in its tributaries, which do not have sulfur-polluted waters and thus allow the existence of fish communities. However, in the period of about 50 years of the exploitation of the sulfur carer, but also after its closure, the Neagra Șarului River acted as a barrier to the dispersal of the fish populations among the tributaries that flow into the river, this led to the decrease of the population of fish and sometimes go to their disappearance.

Capture of surface water for hydro-power plants (J02.06.06)

Location and intensity of J02.06.06 threat on fish:

- NW part of National Park Calimani: Mijlociu creek, Tihu creek, Tihulet creek, Rusca creek, Răstolița creek: *High (H)*

Due to the build-up of the accumulation dam in the Paraului Mijlociu river due to and the future underground water supply from tributaries, jointing with the variation of the hydrometeorological elements in the area, it is possible to reduce the flow of the tributaries creek in the north-western part of the National Park and thus there is a very high risk for fish populations in this part.



Figure 5. Aspects of threat J02.06.06

Fires (J01.01)

The climate conditions from the recent years highlighted the presence of very hot and dry summers, which favored the dryness phenomena of grass vegetation and even wood vegetation in certain areas of the park. Especially in the NV area of the park, around the sulfur career, a part of the wood vegetation is dry, this is a risk factor for the rapid propagation of fires. To firewood initiation and propagation can also contribute to the wood deposits made of coniferous branches deposited in the exploitation areas. Besides of this natural risk of fire, the human factor may contributes to initiation of fire.

Location and intensity of J01.01 threat on fish:

- In all areas of the park - *Low (L)*
- Especially in the NW part of the park downstream of the sulfur quarry where the dry vegetation is present - *Ridicată (R)*



Figure 5. Aspects of threat J01.01

Field downfall, landslides (L05)

There are many areas where the forest exploitation use the shaving of woody vegetation on large portions of land, such as the land remains exposed, where there are large slopes with raven phenomena due to rainfall, where there are extreme hydrometeorological phenomena (frost-thaw phenomena, torrential rains, extreme drought). In these areas all these phenomena can lead to soil erosion and to the transport of soil to the water courses.

Location and intensity of L05 threat on fish:

- In all areas of the park - *Low (L)*
- Especially in the NW part of the park, where the slopes limiting the running waters are very abrupt - *High (H)*



Figure 6. Aspects of threat L05

The phenomena of field downfall and landslides can obstruct the watercourses, that will cause on the one hand the lost of the longitudinal connectivity of water and fish populations, and on the other hand will even lead to the fish starvation due to substrate coating of benthic organisms that constitute the main trophic resource of river fish and the fish asphyxiation due to the water disturbance.

Avalanches (L04)

The high slopes and deforestation areas are at risk of avalanches. The production of avalanches leads to the storage of large amounts of snow in the bed of watercourses, which leads to the asphyxiation of the fish and the spawns existing in the riverbeds especially during the cold period of the year.

Location and intensity of L04 threat on fish:

- In all areas of the park - *Low (L)*
- Especially in the NW part of the park, where the slopes limiting the running waters are very abrupt - *High (H)*



Figure 7. Aspects of threat L04

Traps, poisoning, illegal fishing (F03.02.03)

As a result of park values promoting, it is likely that tourist pressure will increase, which is also a risk factor for preserving fish populations in natural watercourses. Practicing an illegal fishing with natural or artificial bait is very destructive, especially during autumn, October, November, when trout adults climb to springs for spawning.

Location and intensity of F03.02.03 threat on fish:

- In all areas of the park - *High (H)*
- In the NW part of the park, where fish populations are not abundant - *Low (L)*

Management measures for fish species

The themes of the management plan are:

- Biodiversity management;
- Education, awareness and communication;
- Supporting human communities around the park, local cultural heritage and local economy;
- Tourism and recreation management;
- Effective management of the park.

From the point of view of biodiversity management there is a list of habitats and species for which conservation measures will be applied. On this list is included also the fish species *Cottus gobio*, whose conservation status on the park surface is unfavorable, which requires a series of measures (Table 1).

Table 1. Management measures proposed for identified pressures and threats

Code Pressure / Threat	Management measures
B03 - Forest exploitation without replanting or natural restoration	M1. The National Forestry Administration at the request of the Administration of the National Park Calimani & Tasuleasa Social - has the obligation to discuss the Forest Management Plan, together with the other administrative and consultative factors in the area, in order to achieve an environmental program related to the replanting of the exploited areas
B02.04 - Removal of dry or dried trees	M2. The National Forestry Administration and the Romanian Waters Administration - through the local legal representatives - have the obligation to present a program to solve the problem of removing from the watercourses of the fallen trees and branches caused by the floods. Annually, at the meetings of the Scientific Council of the National Park Calimani, a report on the situation of trees and branches in the watercourses of the park will be made by the ANPC responsible. The ANPC will monitor the degree and quality of the planned activities as well as the achieved activities.
B02.02 - Forest cleaning	M3. The National Forestry Administration at the request of the others administrative and consultative factors in the area, has the obligation to find and apply the best forest cleaning practices to remove forestry waste in the adjacent areas where have been executed forestry works. Thus, is prevent the obstruction of the longitudinal connectivity of the watercourses.
H01.07 - Diffuse pollution of surface water caused by abandoned industrial platforms	M4. The National Forestry Administration & the Administration of the National Park Calimani & Tasuleasa Social has to access funds for fish repopulating (trout and other accompanying species). The repopulation will be done on the unpolluted water courses in the area, which have become depopulated due to the loss of the longitudinal connectivity of the watercourses and therefore of the fish. For example, the Neagra Sarului River polluted by the former mining exploitation, is a barrier to fish migration. The restocking activity will be followed at least 1-2 years by an inventory activity of the rate of recovery of fish populations.
J02.06.06 - Capture of surface water for hydro-power plants	M5. The Romanian Waters Administration at the request of the Administration of the National Park Calimani & Tasuleasa Social has the obligation to present the plan of measures that accompany the project of realization of the hydropower plant localized on the Rastolita river, to establish the necessary measures for diminishing the effects of water abstraction from the tributaries of the NW side of the park.
J01.01 - Fires	M6. The Administration of the National Park Calimani and the National Forestry Administration & Economic Agents, which are authorized to carry out the activity of collecting forest berries in park areas, have the obligation to inform and control the seasonal community of forest berries pickers, as well as the tourists and the forestry workers, about the prevention and

	extinction of fires.
L05 - Field downfall, landslides	M1. The National Forestry Administration at the request of the Administration of the National Park Calimani & Tasuleasa Social has the obligation to discuss the Forest Management Plan, together with the other administrative and consultative factors in the area, in order to achieve an environmental program related to the replanting of the exploited areas.
L04 - Avalanches	
F03.02.03 - Traps, poisoning, illegal fishing	M7. The Administration of the National Park Calimani and the local Fishermen Association who release premises for sport fishing in mountain waters have the obligation to intensify the controls and monitoring within the park's perimeter to prevent or detect possible acts of illegal fishing carried out by tourists, seasonal community of forest berries pickers and other which are found in the perimeter and outside the park.

Recomandation

Assessing the effectiveness of protected area management actions is an important tool whose application differs from one region to another (Leverington et al, 2010). To this end, at the request of the World Bank, using the framework recommended by the World Conservation Union (WCPA), as part of the World Conservation Union (IUCN), was developed by the World Nature Conservation Fund (WWF) Evaluation Methodology Rapid Protection and Prioritization of Protected Areas Management (RAPPAM) (Ervin, 2003).

This system was originally projected to evaluate networks of protected areas. It was developed by WWF between 1999 and 2002, with field testing in France, Cameroon, Algeria, China, and Gabon. RAPPAM has been implemented in over 40 countries and over 1000 protected areas in Europe, Asia, Africa and Latin America and the Caribbean. Useful reports of the status of protected area systems or groups are produced, suggesting priority of protected areas in terms of the values and vulnerabilities and analysing the trends in protected area management issues (Ervin, 2003).

Due to the fact that one of the key steps in implementing RAPPAM is based on integrating the information and interests of the various stakeholders in the protected area, such as protected area managers, policy makers and other stakeholders such as local and international NGOs, academics, local resource users and residents, who are able to communicate their opinions on the different questions, we recommend to apply RAPPAM for the implementation of the future Management Plan of National Park Călimani.

4. CONCLUSIONS

The studies due in park areas have revealed that both habitats and species, as well as ecological processes, are rich and normal, being almost unaffected by man's presence. In the past, the intensity of various anthropogenic pressures has fluctuated, negatively affecting both biodiversity and landscape in certain areas, but in present, in the National Park Călimani, the state of biodiversity conservation is generally good.

For the time being, the Călimani Mountains are not a tourist destination, however, the tourist industry, which is in full growth, may pose a threat to the park, with additional costs for its control. Observations should also be made of the natural processes that are ongoing, some of them undetectable and other unexpected, such as avalanches, landslides, wind blows and the like. Besides, it is necessary in the next years to zoning the risks to biodiversity.

Assessing the effectiveness of management is an essential component of management systems. It is increasingly important to have well designed monitoring systems that are relatively easy to apply. Monitoring oriented towards management along with scientific monitoring can provide very good information for improving management and increasing stakeholder support.

5. ACKNOWLEDGEMENTS

The author thank to the Tășuleasa Social ONG and to the Administration of Călimani National Park as beneficiar and multiplicator of project's informations of Environment Sectorial Operational Programme and also to the Multidimension SRL for logistic and suport.

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