

STUDY AND CONSERVATION OF CIKA MOUNTAIN GRASSHOPPER *PERIPODISMA CERAUNII* (LEMONNIER- DARCEMONT & DARCEMONT, 2015), (ORTHOPTERA: ACRIDIDAE)

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Abstract

The Cika Mountain Grasshopper (*Peripodisma ceraunii*) is a Critically Endangered species found only in the Ceraunian Mountains of southern Albania. This paper presents the results of our studies (species, main drivers to threats) and proposed actions shared in a conservation plan. Quantitative studies were carried out with transects, pastoralism status was analysed, drivers to threats were shared with stakeholders. The species was found in areas above 1500m asl, with the highest abundance observed between 1700 and 1950m asl. Among the Ceraunian (Cika) mountain chain, the species is more abundant near the Qorre peak where the pressure of pastoralism is the lowest. The potential threats include overgrazing, habitat changes, climate change, fires, and disturbance. Mitigation plans are proposed for drivers to threats.

Keywords: *Peripodisma ceraunii*; Ceraunian Mountains; Albania; endemic species; conservation plan

Introduction

The Cika Mountain Grasshopper, *Peripodisma ceraunii* (Fig. 1), discovered in 2014 (Lemonnier-Darcemont & Darcemont, 2015) is a species of major conservation concern, classified as Critically Endangered in IUCN Red List (Chobanov *et al*, 2016), geographically limited to the Cika Mountain in the Vlore district of Albania (Fig. 2). Overgrazing by livestock, especially cattle, is a main concern for all species of this genus (Lemonnier-Darcemont *et al*, 2018).

From 2020, with the support of the grants from IUCN SSC and MbZ, we carried out a plan for its conservation. The study was focused on habitat management, species support, research, and public awareness as key goals. This study ended in spring 2022.

Material and methods

Field research

The study area encompasses the Qorre-Cike region within the Ceraunian Mountains, situated along the Albanian Riviera (Fig. 3). This area is under the jurisdiction of two administrative units, with Paliska Peak-Qorre administered by the municipality of Vlora and Cika Peak administered by the municipality of Himara. Cika Peak (2045 m asl), is the highest peak in southern Albania, followed by the Qorre Peak (2018 m asl). The study area partially overlaps the Llogara National Park, classified as a protected area of category II according to the IUCN classification system (Dudley & *al* 2010). The month of August is the best period for the

observation of *Peripodisma ceraunii* as they are the adult phase and they are easily distinguishable from the other species.

Quantitative abundance data of *P. ceraunii* was collected using the Linear Indices of Abundance method, developed by Voisin (1980), which involved walking transects and counting the number of *P. ceraunii* within a defined corridor. Sampling is assigned to an observer walking ten linear 10m transects (1m wide), without overlap, using a 10m-long rope held by the observer. Each transect is randomly sampled by counting, without netting, within the whole area (with homogeneous vegetation structure). The index obtained by the sum of ten transects, results in the number of individuals per 100m².

Habitat characteristics, including soil, vegetation structure, and presence of rocks, were also documented. We used the Prodon (1988) diagram to estimate the vegetation structure. This will help to estimate: % of bare soil ; % of stones ; % of herbaceous vegetation or field layer ; % of dwarf-shrub layer (< 1 m) ; % of shrub layer (1-4 m) ; % of tree layer (> 4 m).

In each locality studied, in addition to the characterization of the vegetation structure we noted the following data: Latitude/Longitude coordinates and the elevation; the orientation of the place, the degree of the slope; the date, time and weather conditions, but also if possible the temperature and wind force; if the station is located in a homogenous area or ecotone; signs of pastoralism.

Land use

We followed the Mil'Ouv diagnostic method (Buffin *et al*, 2014). This methods covers the following points: Global understanding of the farms involved, such as identification of the objectives of the livestock farmer, the perceptions of the stock farmer with regard to Cika Mountain habitats and the stock farming system; Eco-pastoral diagnostic to understand the interaction between the operating mode and the habitats, to evaluate the ecological issues (*P. ceraunii* used as a bio-indicator) and the impact of changing practices on the environment.

The work follows five successive steps:

1. Knowledge of the agro-sylvo-pastoral context: (Geomorphology, landscapes, history of human use, status of the environment).
2. Discussions with farmers to provide an inventory of the practices, perceptions, expectations and needs of the farmer, to describe and characterize the structure of the farm, the production objectives and the flock feeding strategy in relation to the habitats used and the desired resources.
3. Synthetize and represent in graph the use of lands (boundaries, Management Units, herd species and size, daily circuit, seasonal migration, rest areas, watering places, any other information useful for discussions with stakeholders).
4. Target data to collect *in-situ* (diagnostic) such as the status of the environment, through bio-indicators, inside each management unit of particular interest and description of the natural resource (i.e. main vegetation structures).
5. Review, recommendations and sharing, the aim is to have a convergence of conservation perspective and farming perspective (Area to be excluded by some species of flock, area to be avoided at some periods, area to manage brushwood extension, etc.).

One additional step (step 6) to be implemented after setting up the conservation plan, will be the monitoring of the stock farmer's practices in the long term by adjusting or refining the changes to the practices, evaluate the impact of these changes in the environment and on the farm, and provide support, if necessary, to help to satisfy the technical needs of the farmer.

Conservation plan

We followed the IUCN guidelines for species conservation planning (IUCN, 2017) for the five stages of the plan phase: Prepare, collect information, build a vision and goals, analyse threats and set objectives and performance indicators, plan actions (publication of a conservation plan). The first stage included the training of Albanian researchers. The fourth stage included a workshop with stakeholders (Regional agency of protected area, herders, plant collectors, NGOs). From the last stage, the document has been issued in Albanian and English languages. Concerning the stages 6 to 9 of implement/learn/adapt phase (Implement and monitor actions, evaluate and adapt, learn and communicate, revisit planning), we covered the stage 8, particularly focused on public awareness.

Results

Field research

During August and September 2020, studies on the status of the populations were realized along the mountain range between Cika peak and Paliska peak. Complementary studies were performed during the summer 2021 (Fig. 4).

When appropriate (homogeneous vegetation structure on a required dimension of the area and acceptable difficulties to perform due to slope, stones, etc.), quantitative measurements, density per 100m², were performed. In the other case, semi-quantitative (counting during 5 minutes' walk) and qualitative (presence/absence at one spot with records of associated covariates) were realized.

A total of 15 quantitative and 9 semi-quantitative measurements were performed.

The areas with the highest concentration of the population are located in both (North/South) directions from the Qorre peak, especially to the South, towards the Cika peak, in an average altitude range of 1700 to 1950 m. In higher altitudes, with the habitat characterized by a high percentage of rocks and stones and heterogeneously distributed plant areas, we noticed a decrease in the number of individuals.

The density of individuals on Paliska mountain is lower. This peak is also lower in altitude (< 1700 m). The lowest altitude with the observed presence of the species is 1530 m.

The highest density recorded was 23 individuals per 100 m², the average is 10 around the Qorre peak and 4 on Paliska mountain.

The vegetation structure of the localities with the highest densities of Cika mountain grasshoppers is as follows: bare soil: 10 to 30 %, stones: 30 to 50 %, herbaceous vegetation: 30 to 40 %, dwarf shrub layer (<1m): 0 to 5 %, shrub layer (1 - 4m): 1 to 10 %, tree layer (>4m): 0 to 5 %.

Some plants commonly observed during the field work were: *Achillea millefolium*, *Sesleria albanica*, *Lotus corniculatus*. A wide spread on the northern part of Ceraunian mountain chain was the presence of *Thymus* sp. and *Juniperus oxycedrus*. *Sesleria albanica* is an endemic species of the Llogara National Park spread over an altitude of 1600m, overlapping with *P. ceraunii* distribution on a large part. The monitoring plan of *S. albanica* is also important for the protection of the species.

The total EOO (Extent of Occurrence) of *P. ceraunii* is estimated at 4 km².

Land use

In collaboration with shepherds from the protected area of Karaburun and Llogara, as well as the Administration of Protected Areas of Vlora, it has been observed that most farmers are concentrated on the Karaburun Peninsula. These farmers have contracts with the Regional Administration of Protected Areas of Vlora, allowing them to use designated pastures for which they pay a predetermined fee. The pastures are divided into summer and winter pastures, and the payment depends on the number of livestock owned by the farmers. Currently, all contracted pastures are located on the Karaburun Peninsula and are used by around 40 herders. The cumulative pasture area covers more than 1000 hectares during winter and 200 hectares during summer. Approximately 2000 sheep, 2000 goats, and fewer than 100 cattle graze in this area. The Qorre and Cika peaks are not suitable for livestock grazing due to difficult access conditions and lack of water. In the northern part of the Qorre mountain (Paliska Mountain), there are currently five herders grazing about 1500 sheep, 500 goats, and less than 50 cattle. The grazing pressure in this area is possibly higher as some data are lacking. South of Mount Cika to Gjipe, there is a total area of approximately 3350 hectares, including 2250 hectares of pasture and 1100 hectares of forest. Nine grazing contracts, lasting six months, have been established for this area. About 2700 small ruminants (2000 goat and 700 sheep) and 100 cattle graze in the contracted areas. Significant grazing activities have been observed in the Karaburun Peninsula and Paliska Peak. The top of Qorre peak has only sporadic daily grazing occurrences with only one herder over the area in August with a capacity of 200-300 sheep and goats and no shepherd uses the area for an extended period. The challenging weather conditions, including fog and lightning, make these habitats unsuitable for prolonged livestock grazing and herder presence. In contrast, grazing activities are more intense in Paliska Mountain, with approximately five herders leading about 2000 goats grazing there from July to November. In conclusion, the majority of livestock movements occur around the boundaries of the Karaburun massif, outside the area of occurrence of the Cika Mountain Grasshopper; among around fifty herders working in the region, only five impact the area on the Paliska Mountain, and one occasionally impact the central area. No cattle graze nowadays on the Cika massif, at the altitudes occurred by *P. ceraunii*.

Conservation plan

Four main threats have been identified, listed hereafter, from higher risk to lower one: 1. Habitat changes and decrease of habitat quality, by a change of grazing system or by an increase of medicinal plants collection. The decrease of habitat quality will lead to a slow decrease of the population, up to the extinction. However, the trend can be measured on a regular basis in order to adjust conservation actions in case of negative results.

2. Decrease of habitat availability by destruction of areas linked to works (dust roads, etc.), installation of wind farms, etc. The decrease of habitat availability can lead to a fragmentation and isolation of sub-populations, increasing the threatened status of the species.

3. Climate change with increased wind, lightning and natural fires.

4. Disturbance and crushing in the case of the size of flocks crossing the occupancy area is significantly increased.

Today, the species is threatened only in the northern part of its distribution area, in the Paliska mountain, due to grazing pressure slightly too high. Despite no excess as grazing pressure, traditional plant collection, has been observed in the rest of the massif, the aim of the plan is to anticipate the potential drivers to threats which could change the balance in the future.

The drivers to threats have been analysed by all stakeholders together (Fig. 5), reported in the conservation plan with actions avoiding the risk or mitigating if it occurs.

The main drivers to threat with higher impact are as follows:

1. Grazing system: In this type of habitat, the grazing pressure is of major importance. It must not be suppressed and it must not be in excess. A good balance has to be reached and it depends on the composition and size of flocks, the period of land use according to the altitude, the way to manage grazing routes. Main action plan is carried out through the grazing contracts, and monitoring, in the threatened area.
2. Dust road access to the mountain range as a way for firemen with construction of water systems against fires, as a road to access to wind farms if considered suitable, etc. The construction of such a system creates space for opening paths and creating easier access to the top of the mountain. An open dust road can lead to better access for herders, plant collectors, etc. This could have a consequence such as transporting cattle by trucks to higher pastures, and then drastically changing the grazing system in that area. Main action plan is carried out through the limitation to access to the dust road to firemen and other authorized people with fencing and monitoring.
3. Collection of medicinal plants: Associated to an increasing market of medicinal plants, this also increases the number of plant collectors, with higher probability that some of them use wrong collection methods of medicinal plants, leading to a progressive destruction of the habitat. Action plan is carried out with agreements for collecting method, allowed period, maximum volume of plant collected.
4. Fires: Today, the fires mainly occur in the Karaburun-Llogara area at lower altitudes to illegal activities of uncontrolled fires, aimed to clear pastures to generate new grass. The fires are lit in August before the rains, in order to have the grass ready in September. This is the worst period for the species (reproduction period). So far, fires caused by human activity in the Qorre-Cike area altitudes are rare, two times in last five years, because people do not yet use this area for livestock grazing.

In the final conservation plan document resulting of the workshop, the four goals (Habitat management, species support, research, public awareness) have been divided into height objectives (Land-use management, fire management, control of general local planning of the municipality, legal protection / law enforcement, monitoring, better understanding of the biology and ecology of the species, managing tourism impact, awareness) and the implementation has been described through twelve actions. RAPA (Regional agency of protected areas) is responsible of actions with support of NGOs and firemen for some of them.

Discussion

The successful implementation of the action plan requires collaboration among protected area managers, local communities, livestock farmers, and relevant stakeholders. Regular monitoring and evaluation of the plan's effectiveness will be crucial to adapt strategies and ensure the long-term conservation of *P. ceraunii*.

It is essential to develop official programs or plans that incorporate monitoring protocols. It should be implemented by the Ministry of Environment, specifically the National Agency of Protected Areas, in collaboration with the Protected Areas Regional Administrations.

Continuous monitoring of the presence and abundance of *P. ceraunii* in the study area is crucial. The focus of efforts should be concentrated along the Cika mountain, where the species has the highest density. The development and implementation of monitoring plans should be an integral part of the management plan for Llogara National Park. It is important that the management plan includes specific provisions for monitoring *P. ceraunii*, ensuring that the species is continuously monitored by the park authorities. This will facilitate the integration of species conservation into broader biodiversity management strategies.

Furthermore, on-going consultations with shepherds and touristic guides in the area are essential. It provides an opportunity to educate them about the identification of this Cika Mountain grasshopper and raise awareness about the challenges posed by grazing and camping activities. By involving the stakeholders in the conservation process, effective solutions can be identified to meet their needs while ensuring the protection of the species.

To enhance public awareness and engagement, the placement of information boards is recommended. One has been installed at the beginning of the path to the peak, within the frame of this study. These boards can provide information about *P. ceraunii*, its conservation status, and the importance of protecting its habitat.

By implementing these measures, the conservation of *P. ceraunii* can be effectively integrated into management practices and contribute to the overall preservation of grassland biodiversity in the region. According to a law concerning the boundaries of National Parks, (Decision No. 59, dated 26 January 2022 "Regarding the approval of the change of status and boundaries of Natural National Park ecosystems - Category II of Protected Environmental Areas"), the boundaries of National Park of Llogara have been modified. Previously 1010 ha, the National Park extends over 1792 ha and includes the area of Mount Qorre and Mount Çika. The management is under the administration of AdZM Vlore (Regional Administration of Protected Area). The area of occurrence of the grasshopper is now mainly included in the Park. So, the Cika Mountain Grasshopper conservation plan is integrated within action plans of the National Park. This will contribute to the sustainability of conservation actions for this species in the long term.

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Legend of figures:



Figure 1. *Peripodisma ceraunii* female (Photo M. Lemonnier-Darcemont)



Figure 2. Map of the region of the study



Figure 3. Overview of the mountain range (Photos with drone C. Darcemont)

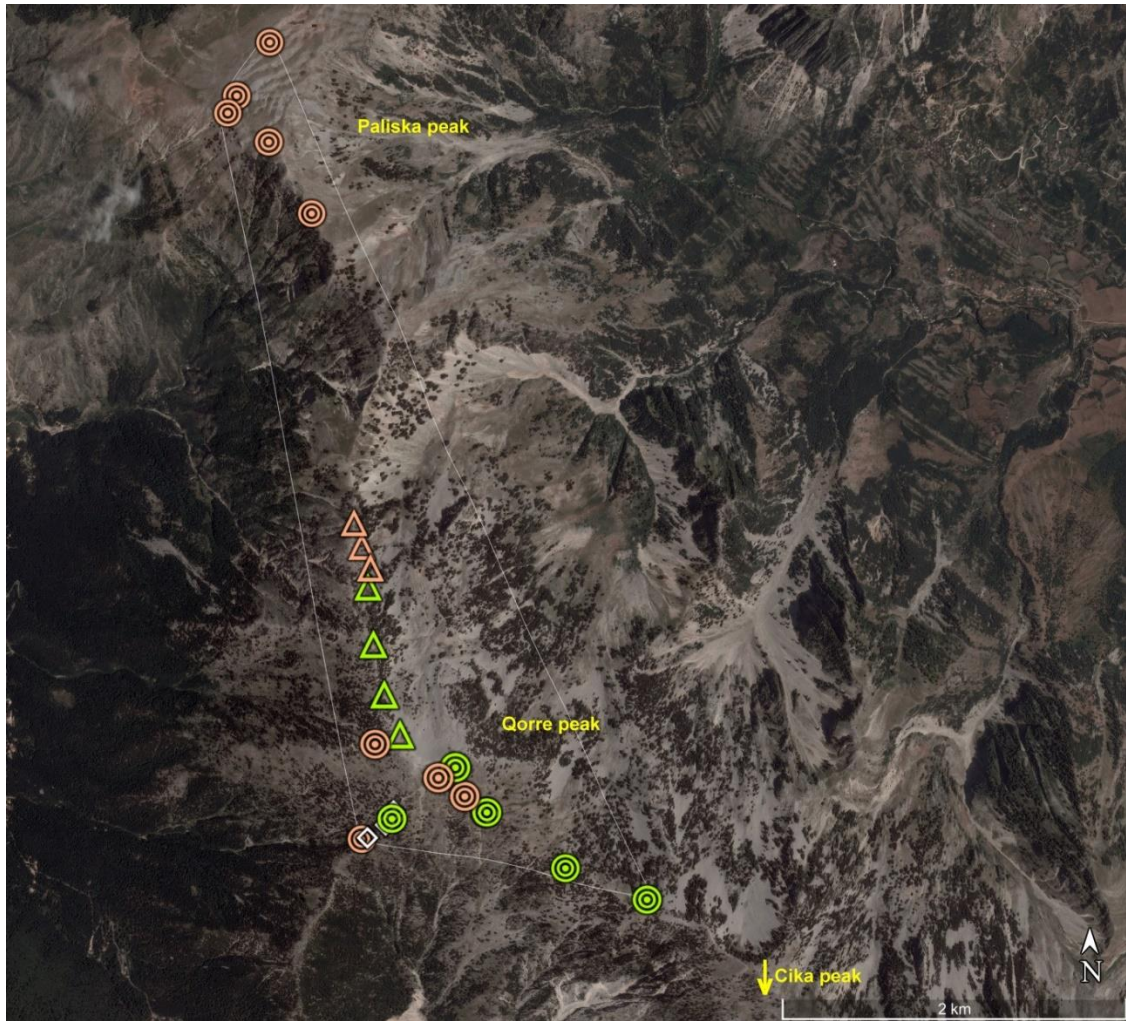


Figure 4. Distribution of the Cika Mountain Grasshopper. Concentric circles: location of quantitative measurements (transects); triangle: semi-quantitative measurements; losange: no quantitative measurement. Colours: green = 10 individuals at least per 100m², salmon = less than 10 individuals per 100m².



Figure 5. Workshop in May 2021 (Photo E. Celohoxhaj)