Conservation plan for the Cika Mountain Grasshopper

Peripodisma ceraunii Lemonnier-Darcemont & Darcemont, 2015

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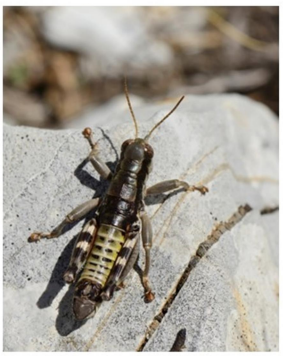
1 Introduction

The genus *Peripodima* (ref. 1), endemic genus of the Pindos mountain range in NW Greece and S Albania, is composed of 3 threatened species.

Orthoptera, Acrididae, Melanoplinae, *Peripodisma*

Endemic medium size mountain wingless grasshoppers, all threatened.

Peripodisma tymphii → Willemse, 1972 is **Endangered**



↑ *Peripodisma llofizii* Lemonnier-Darcemont & Darcemont, 2015 is **Near Threatened**

← *Peripodima ceraunii* Lemonnier-Darcemont & Darcemont, 2015 is **Critically Endangered**

The Cika Mountain Grasshopper - *Peripodisma ceraunii* (ref. 2) is a Critically Endangered species (ref. 3) with a very restricted distribution, only known from the Cika Mountain in Vlore district of Albania. This species is threatened by domestic livestock grazing, particularly cattle grazing, resulting in a declining population trend (ref. 4).

Peripodism ceraunii has a low ecological valence and therefore plays an important role in our vision of the local ecosystem and serves as a bio indicator for the ecological status of its habitats. This species can reliably indicate disturbances in the environment and we can infer the effects of those disturbances on other species and the overall biodiversity.

Being an endemic species only in the south-western part of Albania and with a limited distribution, where its populations consist of few individuals, *P. ceraunii* is more sensitive to threatening factors compared to other species with a wider ecological valence or distribution. It, therefore, requires special attention in order to take measures for its conservation and the protection of its habitats.

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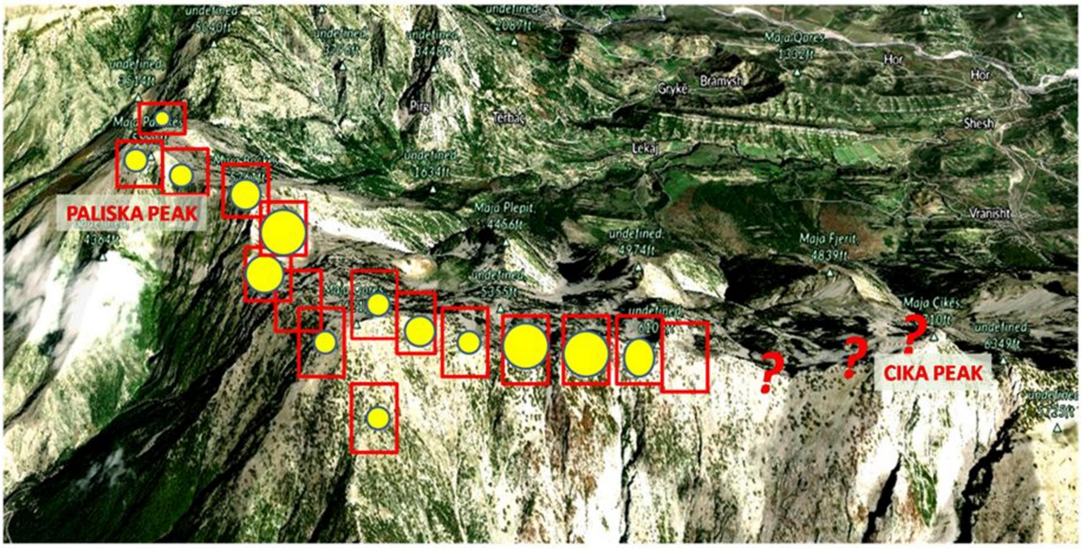
2 Status of the species on Cika Mountain

2.1 Current distribution

Peripodisma ceraunii is found only in Ceraunian Mountains, from where it got the name *ceraunii* (Lemonnier-Darcemont & Darcemont, 2015).

The Qorre-Cike area is located in the Ceraunian Mountains, with a geographical distribution along the Albanian Riviera at altitudes above 1900 m. This area belongs to two administrative units, with the Paliska Peak-Qorre administered by the municipality of Vlora and the Cika Peak administered by the municipality of Himara. Cika peak is the highest peak in southern Albania (2045 m above sea level). Qorre peak is the second highest peak (2018 m asl). The area is included within the boundaries of Llogara National Park (category II according to IUCN categories). The park's terrain includes large alpine meadows (Qorre and Cika mountains), vertical rock faces (the mountains are composed of limestone and dolomites), precipices and dense forests (below 1500 m). Mediterranean climate characterizes this region with hot summers and dry and cold winters. Despite the vicinity to the Mediterranean climatic region, an alpine climate prevails at Cika Peak.

The species is found above 1500 m asl up to the summits. The stations with the highest abundance are located between 1650 and 1850 m asl.



Density map

The number of individuals on Paliska Mountain (area located in the northern part of the Ceraunian mountain chain) is smaller which is related to the fact that presence of a high number of livestock in this part is considered as a threatening factor of this species.

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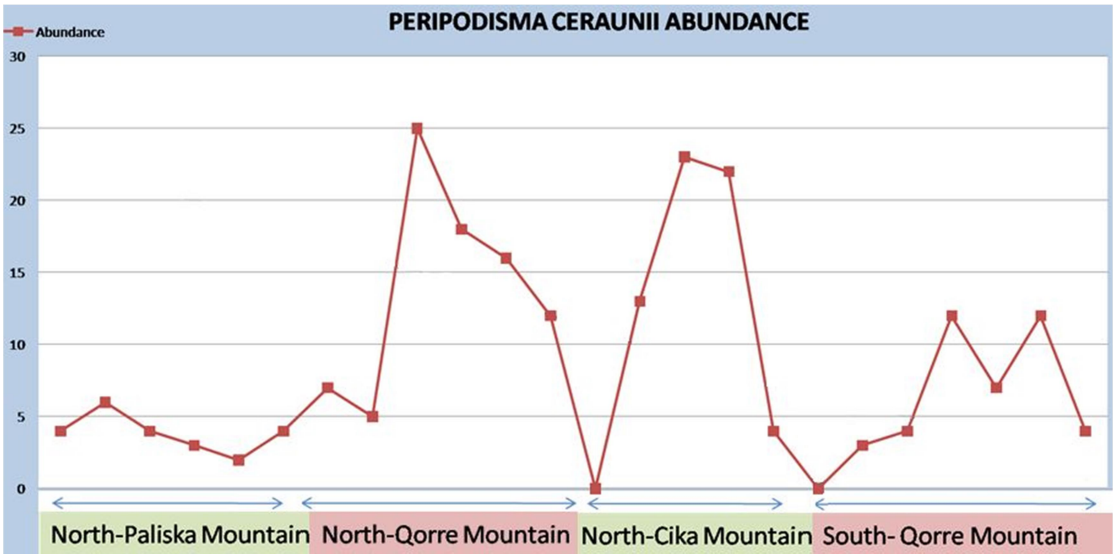

Abundance along the observation points from north to south of the massif (along the ridge)

The characteristic plants observed during the field work were: *Achillea millefolium; Sesleria albanica; Lotus corniculatus*. A wide spread on the northern part of Cerauninian mountain chain was the presence of *Thymus* sp. and *Juniperus ocycedrus. Sesleria albanica*, is another endemic species of the Llogara National Park spread over an altitude of 1600m, and *P. ceraunii* uses it as a shelter and food in some occasions. The monitoring plan of *S. albanica* is also important for the protection of the *P. ceraunii*. *Lotus corniculatus* is another species very widespread in this area which belongs to the Fabaceae family and serves as the main food for *P. ceraunii*. Meanwhile, along the direction of Mount Cika, a wide spread of *Achillea millefolium* was observed, within which stood a considerable number of individuals of *P. ceraunnii*. In areas where vegetation was denser and the habitat was more exposed to the sun with a distance from the trees, a larger number of individuals were observed.

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The table hereunder indicates the sites where the presence of *P. ceraunii* is confirmed in 2020/2021.

Site 100m²	Lat/Long WGS84 Coordinates	Elevation	Orientation	Degree of the slope	Density of the population	Sign of pastoralism
Qorre	40°12'43.59"N 19°36'10.94"E	1699m	South-West	40°		No
Qorre	40°12'48.16"N 19°36'16.77"E	1833 m	South-West	50°		No
Qorre	40°12'52.46"N 19°36'30.60"E	1904m	South-East	40°		Yes
Qorre	40°12'57.18"N 19°36'28.50"E	1981m	South-East	60°		No
Qorre	40°13'00.41"N 19°36'13.17"E	1983 m	West	70°		No
Qorre	40°12'52.82"N 19°36'25.16"E	2010m	South	60°		No
Qorre	40°12'49.38"N 19°36'35.18"E	1856m	South-East	50°		Yes
Qorre	40°12'49.37"N 19°36'35.38"E	1856 m	South	Mountain ridge		Yes
Qorre - Cika	40°12'40.21"N 19°36'51.49"E	1797m	South	Mountain ridge		Yes
Qorre - Cika	40°12'35.95"N 19°37'07.25"E	1816m	South	Mountain ridge		No
Qorre	40°13'2.12"N 19°36'17.91"E	1950m	North	40°		No
Qorre	40°13'7.68"N 19°36'15.01"E	1900m	North	40°		No
Qorre	40°13'14.97"N 19°36'12.97"E	1745m	North	Mountain ridge		No
Qorre - Paliska	40°13'23.14"N 19°36'12.12"E	1670	North	85°		No
Qorre - Paliska	40°13'25.97"N 19°36'12.69"E	1600	North	Mountain ridge		No
Qorre - Paliska	40°13'29.28"N 19°36'10.95"E	1650	North	70°		No
Qorre - Paliska	40°13'32.94"N 19°36'09.41"E		North	Mountain ridge		No
Paliska	40°14'50.30"N 19°35'51.70"E	1532.4m	North-West	30°		Yes
Paliska	40°14'40.61"N 19°35'45.05"E	1617m	North-West	30°		Yes
Paliska	40°14'37.95"N 19°35'43.17"E	1634.5m	North	40		Yes
Paliska	40°14'32.61"N 19°35'51.87"E	1692.6m	East-North	Mountain ridge		Yes
Paliska	40°14'22.13"N 19°36'00.63"E		North	Mountain ridge		Yes

2.2 Species biology

2.2.1 Life cycle

All species of the genus are adult in July and still found at least until the end of September / mid-October depending on altitude and orientation of the stations.

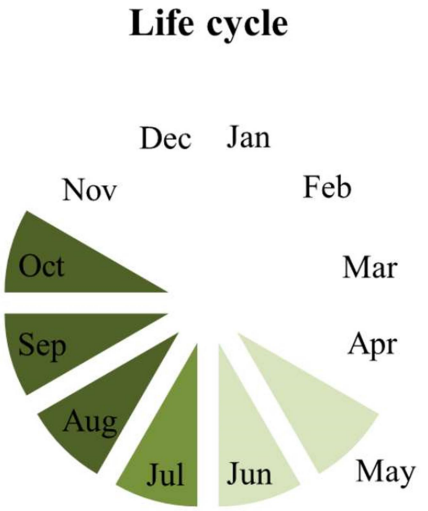
By the end of July couples are commonly observed in copula.

Oviposition occurs most commonly from early August, mainly in the late morning and early afternoon. The nymphs hatch in May.

In May, June and until mid-July, the grasshopper grows through 5 instars (I1 to I5).

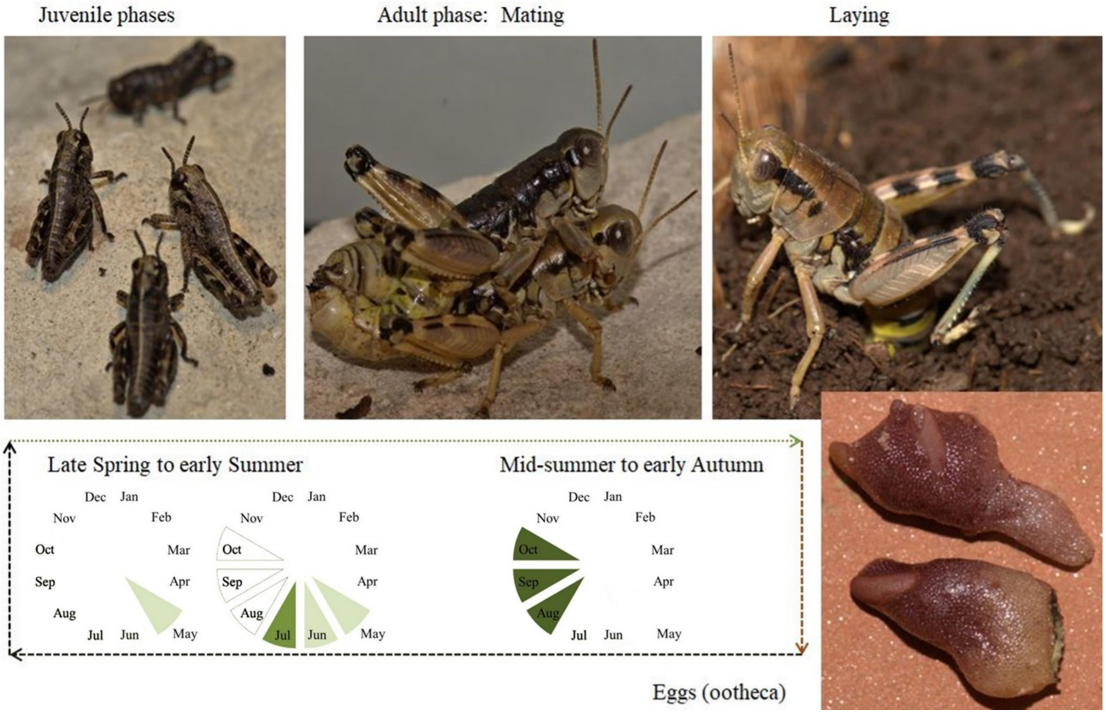
The first adults appear around mid-July (depending on elevation).

Mating and oviposition take place in August, September and until October depending on altitude and weather conditions.



Life cycle: light colour = juveniles, dark green = adults.

In July they become adult before the end of the month.



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The life cycle could be longer than one year (i.e. the egg stage could take 1.5 years rather than just 6 months). The average number of eggs in the ootheca is at least 20 (one sample analysed only). All these points have to be studied.

2.2.2 Population dynamics

The population is inferred to be stable in the middle of the mountain chain (Qorre – Cika), but in decline in the northern part (Paliska).

2.2.3 Disease

Not studied up to now. However the species seems to be not threatened by acari (Tetranychidae) or disease such as *Entomophaga sp.* (fungal pathogen).

2.2.4 Diet and nutrition

While it sometimes seems to consume some Gramineae, the insect is mainly forbivorus, i.e. it mostly feeds on plants with large leaves, mainly dicotyledons.

The characteristic food plants observed during the field work were *Achillea millefolium, Sesleria albanica* and *Lotus corniculatus*. *Sesleria albanica* is another endemic species of the Llogara National Park spread over an altitude of 1600 m, and *P. ceraunii* uses it as a shelter and food in some occasions. *Lotus corniculatus* is a widespread species, which belongs to the Fabaceae family and serves as the main food for *P. ceraunii*. Meanwhile along the direction of Mount Cika a wide spread of *Achillea millefolium* was observed, within which stood a considerable number of individuals of *P. ceraunii*.

2.3 Species ecology and behaviour

2.3.1 Habitat dispersion

The genus *Peripodisma* occurs on limestone substrate as well in shady or adret. It colonizes different habitats and especially meadows more or less rocky and karstic of the Mediterranean montane stage, few subalpine grasslands marked by a more pronounced alpine character but also some open plant formations of supramediterranean stage as clear moors with *Juniperus* sp. on dry rocky slopes. A wide range of the northern part of Cerauninian mountain chain was the presence of *Thymus sp*. and *Juniperus sp*.

Typical habitat characteristics: bare soil 20%, stones 40%, herbaceous vegetation 30%, dwarf shrub layer (<1m) 5%, shrub layer (1-4m) 3%, tree layer (>4m) 2%.

2.3.2 Mobility, dispersal, behaviour

The grasshoppers use stones for shelter and can be easily hide, especially when the weather conditions are not optimal.

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Sexual dimorphism is pronounced, with female adults being larger than males but less colourful. The juveniles do not have a typical colour and are quite homochromatic with the soil.

The best conditions to observe the species are during sunny or partially sunny days, at the end of the morning (time to let the sun to warm stones) until the afternoon.

Male adults (smaller) are faster with long jumps (1 to 3 m), the females are slower with shorter jumps (generally less than 1 m).

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3 Eco-pastoral diagnostic of the Cika Mountain

Albanian herders, as a result of the low support from the relevant institutions regarding the maintenance of pastures and their use, often choose the wrong clearing techniques. But this appreciation is changing and, the positive effects of grazing and pastoralism are more and more recognized. These positive effects are mainly: the use of natural food resources, the production of high quality products, and the maintenance of open landscapes as habitats for numerous threatened species.

Pastoralism is a pretty complex issue in the sense that it deals with a high diversity of situations which needs local diagnosis at different scales with a decisive implication of local actors, especially the livestock farmers. They are key players in building adequate knowledge of these local situations: problems, opportunities, trends and threats.

The Ecological and Pastoral Diagnosis approach can enhance this specification process by defining effective management units (in collaboration with the livestock farmers) as a basis to manage (mainly thought grazing pressure, selective grubbing up, controlled fires, etc.) the vegetation dynamics, monitored at the level of "topo-facies". Specific pastoral interventions have to be designed and adapted to the diversity of the natural habitats and take into account the other/complementary uses and purposes of the natural resources by rural communities (like for example collecting of aromatic and medicinal plants).

So far, in close cooperation with the shepherds of the protected area of Karaburun and Llogara together with Administration of Protected Areas of Vlora, it is noticed that most of the farmers are spread along the Karaburun

peninsula, according to a contract they have with the Regional Administration of Protected Areas of Vlora, for using the pastures, for which they pay a predetermined quota. The pastures are divided into summer and winter pastures and the payment for their use depends on the number of livestock they own, as in the table below. Rangers of the agency are in charge of controlling the area for good management by the farmers (no fire, no woodcutting, etc.).

Currently, all contracted pastures are located on the Karburun Peninsula for about 40 herders, on a cumulated surface of pasture of more than 1000 ha in Winter and 200 ha in summer. This area is grazed by about 2000 sheep, 2000 goats and less than 100 cattle.

The area of Qorre peak and Cika peak as a result of difficult climbing conditions and difficult terrain for livestock is not suitable for the livestock grazing.

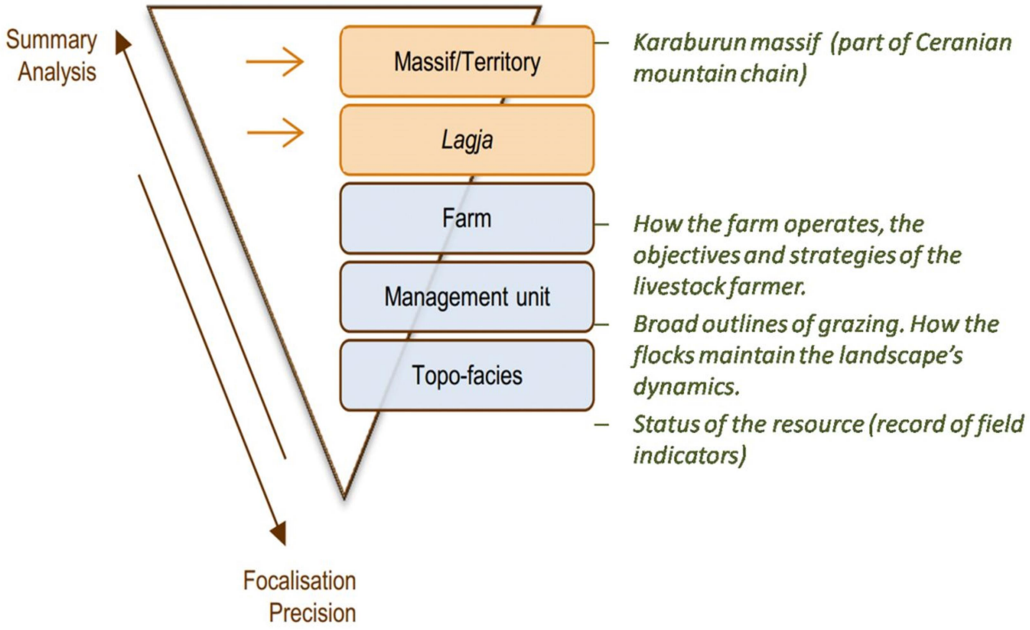
Previously, the area of the top of Qorre and Cika were not part of the protected area "Llogara National Park". With the new proposal of zoning, this area is included in the administration of protected areas, thus increasing the management and protection of this area, in favour of *Peripodisma ceraunii.* But also this will bring the presence of shepherds who will use this area according to a division determined by the Administration and through the re-creation of conditions in the future.

In the north of Qorre (Paliska Mountain, above Dukat in one side and Vlora river valley in the other side), we note currently 5 herders with a total of about 1500 sheep, 500 goats and less of 50 cattle (subject to be increased, as some data are lacking).

Concerning the pastures located south of Mount Cika to Gjipe, this area is about 3350 ha of which 2250 ha is pasture area and 1100 ha are forest area and are located in the forest economy of Cika Mountain Himara and in the pasture economy Dhermi Vuno. In most of this area are made 9 contracts for grazing for a period of 6 months. In the contracted areas graze about 2700 small head (of which 2000 are goats and 700 sheep) and 100 heads of cows.

According to studies conducted in 2020-2021, a part of the pastures are registered and others are not, as their grazing area is outside the protected area. Areas where significant grazing was observed include Karaburun Peninsula and Paliska Peak. At the top of Qorre were observed only sporadic daily cases and not shepherds who use that area for a long period (see 3.2).

The eco-pastoral diagnosis should be made at more detailed scales: farms, management units and topo-facies scales. This requires collaboration with farmers and Regional Administration of Protected Areas



Pastoralism diagnosis

In this case, the diagnosis has been made. The example taken is representative of the pastures in the Karaburun massif, and not near the top of Qorre because we do not have livestock and pastures for which the following study should be done.

- *representative of the farms present on the peninsula* - The purpose of this step is to understand how the farm operates, objectives and strategies of the stock farmer; conduct an inventory of pastoral practices; understand farmer's perceptions concerning the pasture he uses; describe and characterise the structure of the farm, the production and commercialization objectives; measure the feed autonomy and the proportion of open pastoral habitats in the flock's feed; characterise and understand any difficulties encountered by the farmer in managing the rangelands, and more generally in his farming activity.

Flock: The farm chosen is raising around 400 (in the table written 200, because to pay less on the contract they present a lower number of the livestock) goats.

Workforce: the farmer + his son

Reproduction: from August to the birth (January-February),

Production:

- Cheese: around 1500 kg cheese produced and sold to restaurants or individuals and family use.
- Meet: Sold from April to end of August. Most sold are the little goats, who are more in demand from restaurants.

*Difficulties encountered by the farmer: "*Despite the payment we make for the use of the pasture, we have no support in terms of maintenance of the pasture area and suitable vegetation. Ignition of fires is not allowed, so we are often forced not to follow this rule, in order to succeed in our activity".

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View from the shepherd place

The pastoral area of this farm can be divided in Management Units (MU)- Management Units are surface areas managed in the same way, for example a set of grazed areas per specific plot over one or more data periods. The diagnosis at the Management Unit scale permits to describe the broad outlines of grazing, and obtain an insight into how the flocks have an effect on landscape's dynamics. On each management unit, the aim is to observe the pastureland present and the maintenance of the plant dynamics by the flocks, to identify and understand any management problems and to identify the expectations of the stock farmer in order to obtain an overview of the ecological and pastoral issues on these Management Units.

The following figure shows the example of one of the grazing areas in the Karaburun massif (given by the contract made with the Administration of Protected Areas) in which we have a management area and a change in terms of vegetation.

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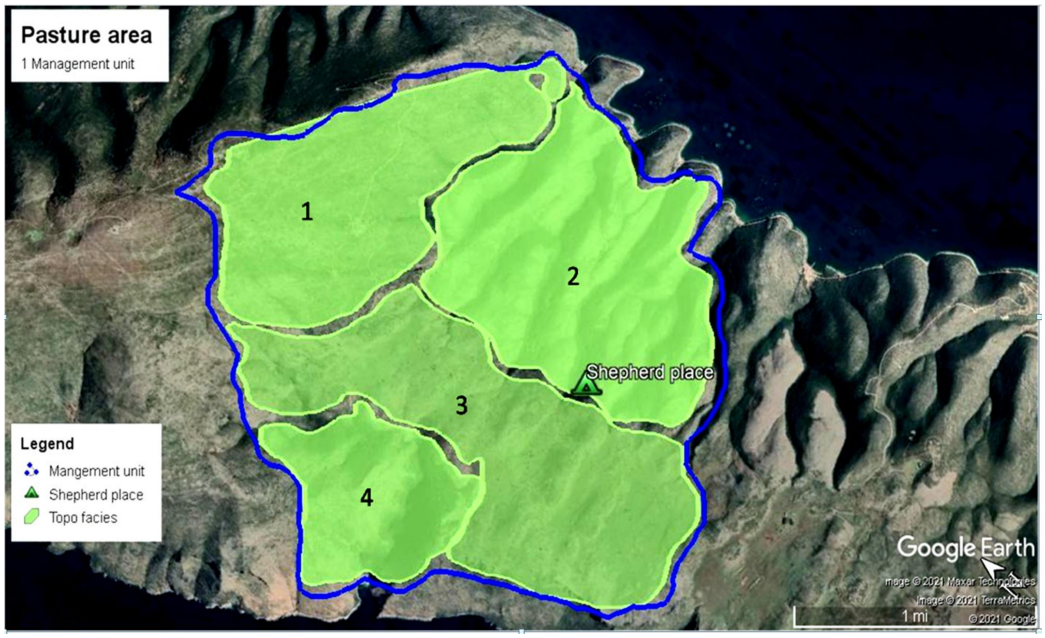

Blue-Management Unit; Green-Topo facies; Shepherd place

Eco-pastoral diagnostic at Topo-facies scale:

Topo-facies is a homogenous unit with regard to vegetation and topography, demarcated by a fence, a barrier consisting of plants, a change of vegetation structure or relief (exposure, soil, etc.). It can be a homogenous habitat or a patchwork of different interwoven habitats. Important is to record field indicators to refine the diagnostic with description criteria for the status of the resource.

Indicators that shows the type of topo-facies are: Description criteria for the pastoral resource: natural habitats present, productivity (quantity, quality), attractiveness; flexibility of use (resource conservation, shadow effect…); capacity of circulation of the flock (presence of physical or topographical barriers, etc. which can make a resource inaccessible to the herd).

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Characteristics of pasture area

Flock circulation	Herbaceous productivity	Herbaceous attractiveness	Resource conservation capacity	Dysfunction	Vegetation diversity		Controlling the dynamics of woody plants	
						Species		
Easy	High	Medium	Low	No	High		Quercus aegilops Low control	Quercus ilex Low control

Conclusions on the topo-facies: The habitat seems relatively stable. There is no indicator of dysfunction. This topo-facies was burned 2 years ago. After fire, *Rhamnus alaternus* is well consumed by livestock. The main species distributed are: *Arbutus unedo, Erica arborea, Erica manupuliflora, Phlomis fruticosa,Thymus capitatus, Drimia maritime ect.*

3.1 History of the pastoralism on this mountain

Regarding the movement of livestock in the direction of grazing areas we have:

- *The Karaburun peninsula* constitutes pastures for the winter period, involving the flocks coming from Dukat and Orikum. But there are also some other flocks coming from farther away such as Vlora River valley.
- Flocks from Radhime, Orikum and Tragjas are moving locally: they are grazing near the villages.
- The Paliska Mountain constitutes pastures for the summer and winter period, involving the flocks coming from Dukat and villages of Vlora river Valley (mostly from Terbac).
- Qorre-Cika mountain chain has no pastures and shepherds that use this area during the winter or summer time. More in the south of Cika, close to Palasa, there are flocks moving from Palasa to the southern mountains.

Type of flocks:

- Little flocks
  - farmers have an additional income or another principal income
  - low workforce and feed costs
- Big flocks
  - livestock as principal activity
  - more distant pastures with seasonal land rental

Livestock flocks movements

Pasture right tax:

For a given plot of pasture, farmers have to pay a tax to National Agency for Protected Areas (NAPA). This tax depends on the number of heads and the carrying capacity of the plot. Until now, plots have been defined according to the existing forests and pastures cadastral plan. A second tax sometimes added to the first. There is an informal market of land leasing, in which some pastoral lands are claimed as private according to a former property status.

Importance of livestock activity:

- Llogara is a very important outlet for livestock productions. The presence of restaurants in the park brings more tourists who enjoy the local products and meat.
- Dukat is a big village and a large part of the milk and meat produced is self-consumed, or directly sold to local restaurants.
- High demand of local products make farmers to have a relatively high bargaining power. Livestock traders need to stock up outside the Dukat Valley to supply the permanent demand of the restaurants (mainly Llogara, and to a lesser extent Radhime, Orikum, Dukat).

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3.2 Structure of flocks, distribution over the mountain range

In the Qorre and Cika Peaks we do not have many activities of pastoralism, where only one herder uses this area during the period of August with a capacity of 200-300 heads of sheep and goats. This is also noticed by the fresh signs that we saw during the fieldwork mainly in the area towards the Cika Peak which is considered as the richest area with vegetation compared to the mountain of Qorre, for instance giving some negative effect on the habitats where we also have the densest population of *P. ceraunii*. Although the grazing period during the August period, the Ceraunian mountains are known for their harsh weather conditions which change within a very short time (foggy weather and lightenings), making this habitats unsuitable for long stays of livestock and herders, that's why just a few of them choose these meadows as pasture areas. The opposite happens in Paliska mountain where grazing activity is more widespread and the number of herders using this area was considerable (about 5) within the July-November period with about 2000 goats in total.

3.3 Periods of land use, movements

According to the data in Table 1, the pastures are divided into summer and winter pastures and their movements are made depending on the payments and conditions that the shepherds must meet. Summer contracts for pastures in the Karaburun massif start in the period 1 June-1 December, while winter contracts start in the period 1 December -1 June. In terms of livestock movements depending on the winter or summer period, according to the weather, resource availability (herbaceous in summits, scrublands lower), water access, etc., most of the area used is around the boundaries of Karaburun massif and Paliska mountain.

Winter and summer movements (yellow-winter pastures; red-summer pastures)

4 Vision and goals

4.1 Vision

We envision sustainable implementation of an optimal management of the habitats of the whole Cika mountain range, sustaining large populations of *Peripodisma ceraunii*, a key indicator of the biodiversity of insects in the higher habitats of the Cika Mountains.

4.2 Goals

Goal 1: Habitat management

Optimal management of the species' habitat is necessary at it has a very low ecological valence and any modification among the habitats, for instance linked to the grazing system or medicinal plant collecting, can have an impact on the community structure of this grasshopper.

According to the study published in 2018: "Effects of changing grazing systems on the threatened genus *Peripodisma* (Orthoptera: Acrididae: Melanoplinae) in the Mediterranean mountains of the southern Balkans", the importance of the impact of excessive pressure of pastoralism, particularly cattle grazing has been demonstrated.

Goal 2: Species support

The species needs to have a legal status of protection in order to give a tool to nature protection guards to react in case of non-respect of rules.

Goal 3: Research

Further studies are needed to fill knowledge gaps about the species. The life cycle duration is unknown (supposed to be one year but not studied). Potential diseases have not been studied. Our knowledge of the diet has to be completed. The structure of the populations along the mountain chain needs to be more studied (to avoid the disruption of community structure) as well as their genetic characteristics.

Goal 4: Public awareness

Increased public awareness of the presence of this unique species and its threats will help to ensure sustainable conservation. Placing information boards will play a very important role in taking steps to conserve the species, at a time when public information is quite limited. These signs can be in the form of information, prohibition or notification to the public.

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5 Threats and drivers

5.1 Current status:

In the area of Qorre-Cika, we do not have currently a large development of grazing (max 200 heads), this is due to the difficult terrain conditions for the movement of livestock (only the presence of goats and sheeps) and a more dangerous area to stay (area known for its particularly large number of lightning impacts during summer). However, in the northern part of the mountain chain, the grazing pressure is much higher (up to 5000 heads in total), certainly linked to an easier access. In this area, we are at the upper limit of acceptable grazing pressure, may be even above the limit. On the whole area, each herder is owner of his livestock.

Currently, there is no cattle on the Cika mountain range, at the altitudes of the area of occupancy of the species.

There is a medicinal plant collecting activity but relatively limited to a reduced number of plant collectors (difficult access). The method of plant collecting is not currently destructive for the habitat.

The development of hiking trails and camping is still at a low level.

Due to the important lightning area in the centre of the massive, natural fires can occur, but have been scarce up to now. Fires from herders are limited in the northern part but are done in an inappropriate period (summer).

5.2 Threats

- Habitat changes (high risk)
    - Decrease of habitat quality (by a change of grazing system for instance).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.
    - Decrease of habitat availability (by destruction of areas linked to works, 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.
- Climate change (low risk)
    - Increased wind, increased lightning and natural fires. The risk of drought seems to be low due to the location of the mountain near the sea and the humidity in the air.
- Disturbance and crushing (low risk)
    - In the case of the size of flocks crossing the occupancy area is significantly increased or the number of hikers considerably increased.

- Collecting (low risk)
    - In the case of this species becomes emblematic and rare and therefore attractive for collectors

5.3 Drivers

The numbers of livestock and its composition

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 the altitude, the way to manage grazing routes along the day. This driver is considered to have a highest impact.

Dust road access to the mountain range.

As a result of the development of the area in recent years, and the increase of the capacities of the managing authorities of the Llogara National Park, as a way to stop the fires we can have the construction of a water system against fires. The construction of such a system creates space for opening paths and creating easier access to the top of the mountain. This can lead to better access for shepherds, plant collectors, etc., as well as easier terrain with access to water. This could have a consequence such as transporting cattle by trucks to higher pastures, and then drastically changing the grazing system in that area. This driver has impact on most of the other drivers and is considered to have a high impact.

Collection of medicinal plants

As a result of the developments that the Protected Area may experience with the increase of capacities, we may have easier access to the top of Qorre Mountain. 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. This driver is considered to have a medium impact.

Increased tourist flow

Years ago, climbing the mountain of Cika, due to its unmarking and the difficulty of knowing the terrain, there were no tourists who visited this area. In recent years, more knowledge for the area and increasing number of local touristic guides, has led to an increase in the number of tourists who visit the area of Qorre-Cike, and stay camping. Facilities in access to reach the top of

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the mountain will bring more tourists and the impact is expected to be bigger. This driver is considered to have a lower impact as it will only affect the paths and camping sites.

Fires

So far, fires caused by human activity in the Qorre-Cike area are very rare, in 5 years it has happened only 2 times, which is because people do not use this area for livestock grazing. But in the case of increased access to the top of the mountain and the creation of water opportunities, shepherds will use this area even more often, and as a result of creating a more suitable habitat for grazing, fires can affect the species populations. This driver is considered to have a high impact.

Why do fires occur in the Karaburun-Llogara area?

Due to mismanagement of the pastures by the state authorities regarding their maintenance, the residents of the area perform these illegal activities of uncontrolled fires. Their goal is to clear pastures to generate new grass, as old dry grassland is less suitable for livestock grazing. 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).

Information

It is often the residents themselves who damage the area and for instance the habitat of the species. It is the consequence of the non-involvement in the co-management of protected areas with the managing authorities such as RAPA Vlora and the lack of information about the importance of species of national and international importance. This driver is considered to have a lower impact.

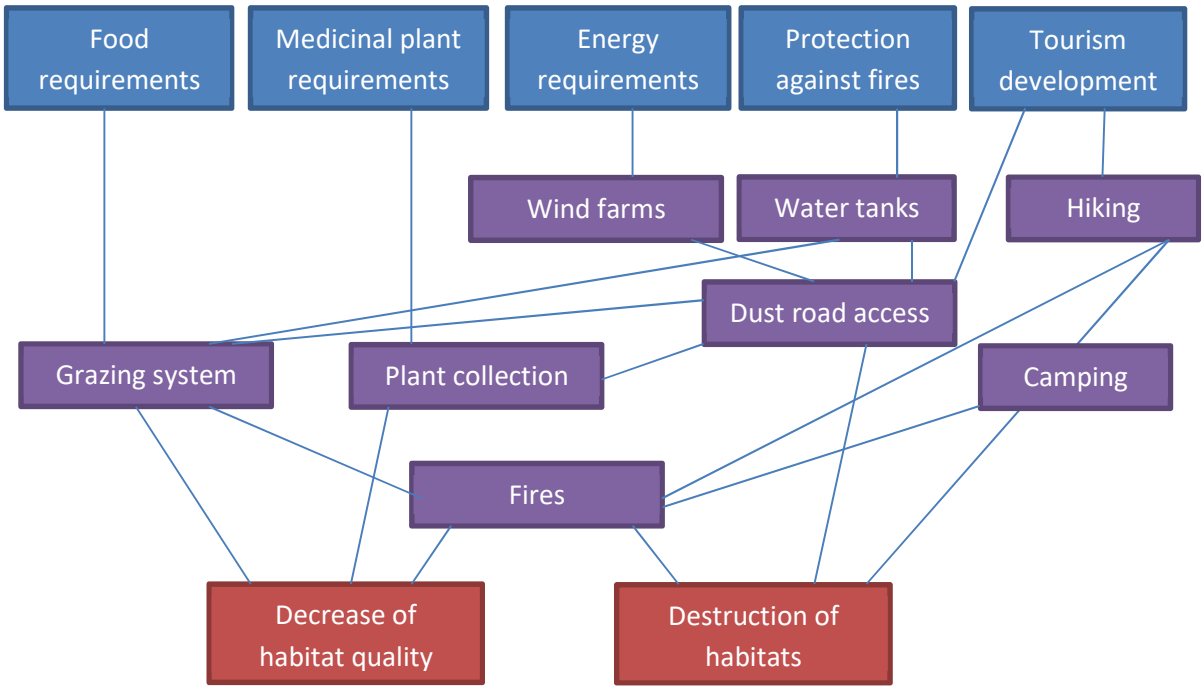
Information can be in-situ (along hiking paths) or ex-situ (information centre, books, websites, video films, etc.). Information has generally a positive impact but may attract collectors in some cases (minor risk with a low probability).

Wind farms

In the municipal planning it has been determined that since the Llogara-Karaburun area is a typical Mediterranean area with strong winds, a way of producing energy is also the placement of windmills. So far they are still being studied. If the area is considered suitable for the placement of windmills, this would have a direct impact on habitat destruction and easier access to the top of any mountain, and causing all of above threats. This driver is considered to have a high impact.

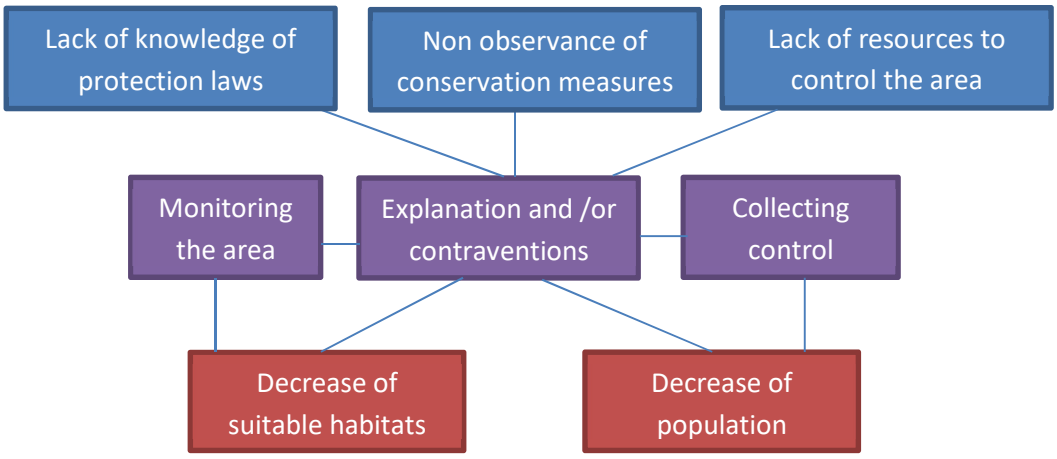
Relationship between drivers and threats for habitat management (Goal 1)

Blue = Constraint, Purple = Driver, Red = Threat



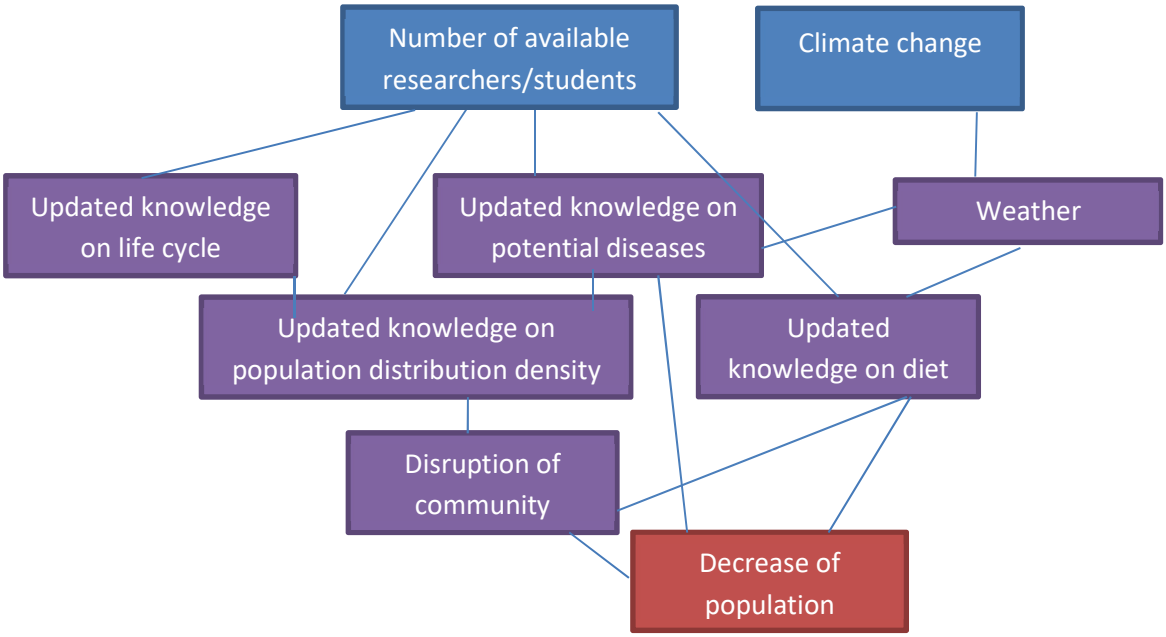
Some drivers can act in both directions. Dust road access can be positive to facilitate the work of firemen; however, without restrictions, it can increase the risk of over-exploitation of the mountain range: overgrazing and over-collection of plants.

Relationship between drivers and threats for species support (Goal 2)

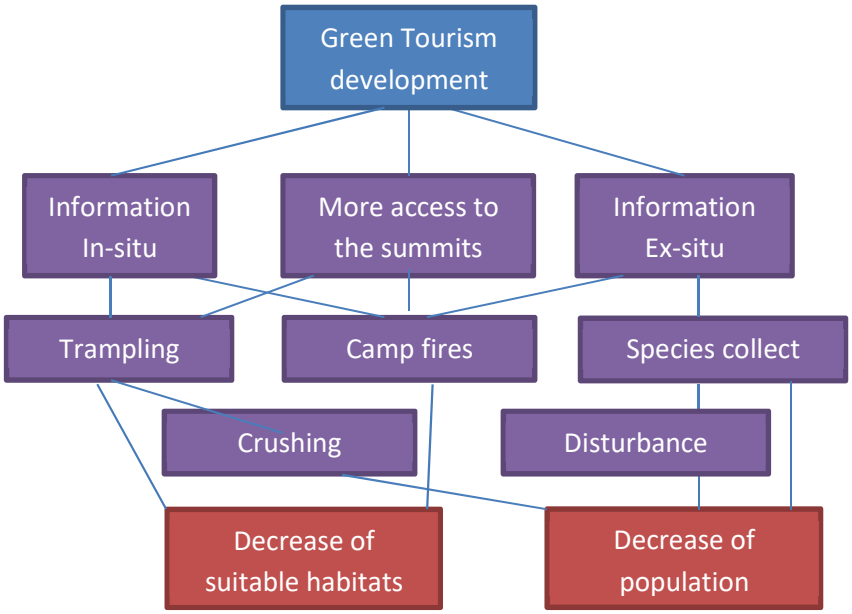


In this case, all the drivers act positively, when correctly applied.

Relationship between drivers and threats for research (Goal 3)



Relationship between drivers and threats for public awareness (Goal 4)



Information drivers act generally in the positive way. However Ex-situ information (through websites, books, papers, video, etc.) could be negative in particular cases by facilitating some illegal insects' collectors. For this particular point, the Goal 2 (species support) is mandatory.

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5.4 Conservation objectives and indicators

5.4.1 Goal 1: Habitat management

5.4.1.1 Objective 1.1 Land-use management

Protected areas have in their duties the contracts for the use of the area of the protected area by the shepherds. These contracts must be done according to a robust study and good co-management between RAPA and shepherds. The same approach must be done with plant collectors, enabling only a few collectors with good practices allowed to collect in this area.

5.4.1.2 Objective 1.2 Fire management

Fire is still one of the problems not easily managed by local authorities such as RAPA Vlora, Prefecture, and state police. A great deal of work is required from all these institutions to capture cases of illegal activities such as intentional fires by residents. Any solution proposed to mitigate the fires has to be analysed deeply before implementation, with anticipation of short and medium side effects.

5.4.1.3 Objective 1.3 Control of general local planning of the Municipality

During public consultation on the local plan review, protected area management authorities, experts as well as local NGOs, should participate and provide the best alternatives for the implementation of the activities envisaged by the municipality, in order to prevent undesirable damage to habitats and species. This is particularly the case on projects impacting the upper part of the mountain chain, such as wind farms.

5.4.2 Goal 2: Species support

5.4.2.1 Objective 2.1 Legal protection or law enforcement

In cases of surveillance of grazing or setting fire intentionally within the surface of the Protected Area, the necessary measures must be taken to find the responsible persons. Strict enforcement is needed for creating the respect of residents towards protected areas and its biodiversity.

5.4.2.2 Objective 2.2 Monitoring

To monitor the population trend, distribution, habitat trend in response to conservation management and ongoing threats.

5.4.3 Goal 3: Research

5.4.3.1 Objective 3.1 Better understanding of the biology and ecology of the species

The taxonomy and the biology of the species is quite well known, but it is necessary to have a better knowledge of its biology and ecology in order to be more accurate in some conservation measures or advises to be taken.

5.4.4 Goal 4: Public awareness

5.4.4.1 Objective 4.1 Managing tourist impacts

Before following the trails, tourists should be well informed about the difficulties of the terrain and species of protection importance. This can be done with information boards along the path and/or leaflets available at the information centre.

5.4.4.2 Objective 4.2 Awareness

One of the most important elements for the conservation of nature in general and species in particular is the environmental education in schools and communities on species of national importance such as the *Peripodisma ceraunii.* In addition to posters and leaflets, a video film on the species and all linked issues can be diffused.

6 Actions plan

6.1 Action 1

- **Objective targeted:** 1.1 Land-use management
- **Driver concerned:** Grazing system
- **Timeframe:** Before summer 2023
- **Result expected:** Contract of land-use between RAPA and shepherds
- **Activities:** Analysis of each area to be used and agreements to be done concerning the land use: Number of sheep, number of goat, no cattle; period of land use, herding activities.
- **Actors:** This work has to be supervised by RAPA
- **Responsible:** RAPA.
- **Resources needed:** Random control in-situ on a regular basis

6.2 Action 2

- **Objective targeted:** 1.1 Land-use management
- **Driver concerned:** Plant collection
- **Timeframe:** Before summer 2022
- **Result expected:** Contract of land-use between RAPA and medicinal plant collectors
- **Activities:** Analysis of each area to be used and agreements to be done concerning the land use: Collecting method, allowed period, maximum volume of plant collected.
- **Actors:** This work has to be supervised by RAPA
- **Responsible:** RAPA.
- **Resources needed:** Random control in-situ on a regular basis

6.3 Action 3

- **Objective targeted:** *1.2 Fire management*
- **Drivers concerned:** Grazing system; Fires (Shepherds)
- **Timeframe:** Before summer 2023
- **Result expected:** Pasture fund management by relevant authorities through contracts as well as involvement of pasture cleaning activities by state institutions
- **Activities:** Analysis of each area to be used and agreements to be done concerning the land use: number of livestock, allowed period, cleaning activities
- **Actors:** This work has to be supervised by RAPA

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- **Responsible:** RAPA.
- **Resources needed:** Random control in-situ on a regular basis

6.4 Action 4

- **Objective targeted:** *1.2 Fire management*
- **Drivers concerned:** Hiking; Fires (Tourists)
- **Timeframe:** Before summer 2023
- **Result expected:** Informing tourists about camping areas and the permissibility of lighting fires only in areas designated by RAPA
- **Activities:** Analysis of the area regarding the suitable places for setting up the camping space and putting up boards on their information; Improve control and administration of the current leisure and recreational activities;
- **Actors:** This work has to be supervised by RAPA
- **Responsible:** RAPA.
- **Resources needed:** Random control in-situ on a regular basis

6.5 Action 5

- **Objective targeted:** *1.3 Control of general local planning of the Municipality*
- **Driver concerned:** Dust road access to mountain range (if occurs)
- **Timeframe:** Before the end of road work
- **Result expected:** No easier access to mountain range, firemen excepted (and wind farm technician if the road is also created for wind farms)
- **Activities:** Installation of a secured gate at the beginning of the road, the keys are given only to firemen.
- **Actors:** This work has to be supervised by RAPA
- **Responsible:** The firemen are responsible of the access to the road. No access derogation allowed, except for fire extinction, rescue and technical maintenance if necessary.
- **Resources needed:** To control the fence on a regular basis

6.6 Action 6

- **Objective targeted:** 2.1 *Legal protection or law enforcement*
- **Drivers concerned:** Lack of resources to control the area, Collecting control
- **Timeframe:** Before summer 2022
- **Result expected:** Strengthening the implementation of the law on protected areas on the prevention of illegal activities in the protected area such as fires; overgrazing or conducting activities without proper permission

- **Activities:** Increase the human capacity of RAPA for continuous control of protected areas
- **Actors:** RAPA; Police Directorate
- **Responsible:** RAPA
- **Resources needed:** Staff

6.7 Action 7

- **Objective targeted:** 2.1 *Legal protection or law enforcement*
- **Driver concerned:** Non observance of conservation measures
- **Timeframe:** Before summer 2022
- **Result expected:** Strengthening the collaboration between all stakeholders at local level for a better management of the natural resources and endemic species
- **Activities:** Establish the dialog between various local stakeholders on the use and management of nature resources they share; Establish good working relationship between PA administration and municipalities; Improve co-operation between central and local government institutions
- **Actors:** RAPA; Orikum Unit Administration; Vlora Municipality
- **Responsible:** RAPA
- **Resources needed:** Need to be exhaustive (all stakeholders involved)

6.8 Action 8

- **Objective targeted:** *2.2 Monitoring*
- **Driver concerned:** Monitoring the area
- **Timeframe**: Every summer during the first 3 years; Every 3-5 years after
- **Result expected**: Assessing the condition of populations over the years and determining the status of species
- **Activities**: Monitoring the populations of the species in its distribution area regarding the number of individuals, presence in existing points or in new areas and habitats; threatening factors
- **Actors:** RAPA; Local Scientists; NGOs; Vlora University
- **Responsible**: RAPA
- **Resources needed**: Training of the RAPA staff, training of local NGO representatives.

6.9 Action 9

- **Objective targeted:** 2.2 *Monitoring*
- **Driver concerned:** Monitoring the area

- **Timeframe**: Every year
- **Result expected**: Building up capacities and strengthening of local management authorities and NGOs
- **Activities**: Organizing trainings and seminars for RAPA staff and students for further research on endemic and endangered species. Delineation of the distribution areal of *P. ceraunii*. Logistical support and providing twinning opportunities with other European countries.
- **Actors:** RAPA; Local Scientists; NGOs; Vlora University
- **Responsible**: RAPA
- **Resources needed**: Logistic support to actors

6.10 Action 10

- **Objective targeted:** 3.1 *Better understanding of the biology and ecology of the species*
- **Drivers concerned:** All drivers of Goal 3
- **Timeframe**: As soon as possible, and before 2025 for all.
- **Result expected**: Increasing the knowledge on the species: (By decreasing priority) Population distribution density and risk of disruption of community, life cycle, potential diseases and diet.
- **Activities**: Support students of Vlora and Tirana Universities to develop the theme of their diploma on the endemic species *P. ceraunii*
- **Actors:** RAPA; Directorate of Universities; students
- **Responsible**: Vlora University; Faculty of Natural Sciences in Tirana
- **Resources needed**: Financial support for students

6.11 Action 11

- **Objective targeted:** 4.1 *Managing tourism impact*
- **Drivers concerned:** All drivers of Goal 4
- **Timeframe**: 2022, and regular improvements all years long
- **Result expected**: Raising awareness of tourists on the presence of endemic species in the area as well as on the implementation of the code of conduct
- **Activities**: Producing guidebook and leaflets on natural values and Eco tourist trails; Prepare a strategy for ecotourism development in the site; Review and improve existing walking routs inside the zones open to public access; Provide with signs and signposts along the walking routs and tracks, as well as with information on the site
- **Actors:** RAPA; local community; tourists; NGOs
- **Responsible**: RAPA; NGOs

6.12 Action 12

- **Objective targeted:** 4.2 *Awareness*
- **Drivers concerned:** Information in-situ; Information ex-situ
- **Timeframe**: Progressive improvement all years long
- **Result expected**: Attitude and behaviour of local community and general public towards nature and culture values of the site changed (reduced bad collection of plants; reduced overgrazing; reduced garbage in nature)
- **Activities**: Consultative meetings with community members during discussions on the management plan as well as the inclusion of the action plan of *Peripodisma ceraunii* in the management plan of NP Llogara; Video filming of the species and the habitat; Social media awareness
- **Actors:** RAPA; local community; tourists; NGOs
- **Responsible**: RAPA
- **Resources needed**: Patient, calm and strongly motivated actors

7 Annex 1: Monitoring protocol

Study and Monitoring

Species monitoring will be done in all locations in the area Llogara-Qorre-Cike-Mali i Paliskes by creating the species map in this area.

All populations should be monitored every 2 years. Periodic species monitoring is a basic tool to monitor the population trend and thus, the conservation status of the species in the area.

During the monitoring, visits will be made to all known areas of the species during the period of reproduction and growth of juveniles.

The period May-October is the best period for the observation of species as this is closely related to the flowering of plants which serve as a food source for them but also to hatchlings and by the end of the reproduction process in early October. However, the quantitative measurements should be done only with adults in mid-summer (mid-July to end of August).

During the fieldwork there should be considered some elements such as:

- Get an accurate vision of the occupancy
    - Note the characteristics of each station.
    - Note the abundance (qualitatively).
    - Synthesise the results in a map of species distribution.
- Measure the size of the populations
    - On a selection of different stations where the species seems more abundant, proceed to quantitative measures.
    - Prioritize the largest station first and then isolated additional stations (not linked to the main by corridor) if exist.
    - Synthesise the results in a map of species density
- Estimate the risks
    - For each station or linked group of stations, estimate the risks and possible mitigation actions.

Criteria for selecting the monitoring area

The purpose of monitoring is to observe changes in population size. Estimating population size and distribution is one of the most effective procedures for assessing a species conservation status and susceptibility. Monitoring areas should be defined at all species locations.

Table 6. Locations for monitoring e *P.ceraunii*	
Mountain chain Qorre-Cike-South of Cika	Throughout the range
Paliska Mountain	A comparative assessment should be made over the years on the change of populations and threatening factors
Stogoi Mountain	Subsequent expeditions will search for possible new species sites

It is advisable to monitor populations consisting of very few individuals and to monitor the existence of species in that area every year during the 3 first years (because the life cycle is still unknown and we have to verify if the species is subject to fluctuations of population size along years) and repeated every 3 or 5 years, as in the case of Mount Paliska where the number of individuals observed is quite low.

On a pragmatic point of view, it is not realistic to reproduce each year the same study effort for monitoring as done during the initial study phase. So at least, the monitoring has to be done in two locations among the not threatened population (currently stable) and the threatened population (decrease), and the main point is to carry it out every year with the same protocol at the same GPS points.

When and where to perform monitoring

At least, the monitoring has to be performed in two locations, one located in the Qorre-Cika area, where the population seems stable nowadays and one located in Paliska Mountain, where the population trend seems to be decreasing.

The GPS coordinates are:

- 40°12'40.21"N, 19°36'51.49"E for the first location
- 40°14'32.61"N, 19°35'51.87"E for the second location

Of course, other locations can be added (coordinates to select among the study report, or new coordinates dedicated to find new localities), but we cannot monitor less than these two locations.

Once selected, it is important to not change the locations throughout the coming years.

One monitoring has to be performed in the first days August, not necessarily the same day for all locations. A second monitoring has to be performed roughly two weeks after (so mid-August in average).

The exact dates are flexible because the main factor is the weather: The day of in-situ monitoring must be a sunny day without strong wind. It can be done the planned day only if this condition is met. If not, the monitoring has to be postponed, one day or more, until the weather conditions are met.

It is important to go early in the morning to the location, and to start the measures after 11:00, but not too late (not after 15:00). During this time slot, the species is outside on the stones, near vegetation and not sheltered. They are visible and can jump instead of going down hidden in the vegetation or under stones.

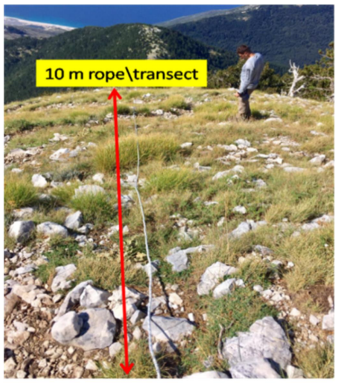
For each location, the year results will be the average between the two measurements (from early August and mid-August of the same year).

Conducting surveys

Necessary equipment in the field: *GPS, rope, (10 m long) compass, field insect manual*

According to the Linear Indices of Abundance (LIA) method developed by Voisin (ref. 5) to measure the density of *Peripodisma* grasshoppers, sampling is assigned to an observer walking ten linear 10 m transects (1m wide), without overlap, using a 10 m 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 of *Peripodisma* per 100m².

Using the rope we attach it to a stone and we start counting after 5 meters of walking (a knot on the rope indicates to start). After 5 meters we start counting the number of *Peripodisma* present in a corridor of 1 m wide (50 cm left, 50 cm right) for 10 meters (second knot to stop).



We repeat the operation 10 times without overlapping the transects: each time in an area not yet disturbed, within the same station (with same vegetation structure).

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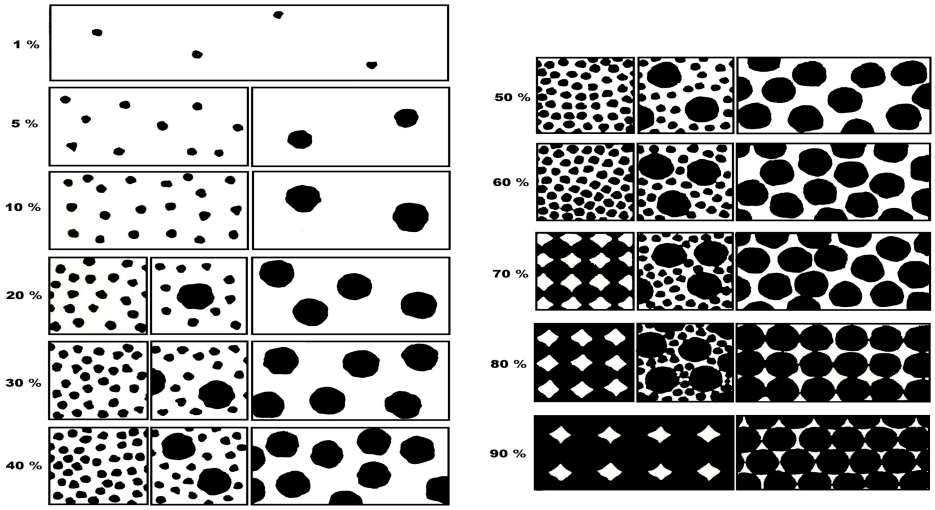
For each station realized it is very important to take the physical characteristics related to the soil, herbaceous plants, shrubs and trees as well as in the case of such rocky habitats, the percentage occupied by the stones. For this purpose, we use the Prodon diagram (ref. 6) to estimate the vegetation 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).



This should be unchanged every year, but it is important to note it at each monitoring. This will help to detect the cases of some changes not necessarily detected in-situ by the observer, but compared afterwards with the past years.

It is very important to note all different data related to the monitoring. These data include: the date, time and weather conditions: sunny, partly sunny, thin clouds, etc., but also if possible the temperature and wind force; signs of pastoralism. This is helpful in case of variation of results between years, to analyse the results and deduct what part of the phenomena is linked to potential discrepancies of the weather conditions between measurements and what part could be assigned to a real population size trend.

In case of some monitoring in-situ studies are aimed to find new possible sites (optional), at certain locations, in an area which is considered to be a possible habitat populated by *P. ceraunii*, we can start walking around the area for about 5 minutes by counting the individuals we see (the correct assessment of abundance depends on the weather conditions). Depending on the number of seen individuals we also estimated their abundance during which if we have 2 or fewer individuals the presence of the specie is estimated as "rare" at the target station, with 3-9 individuals the presence of the species is estimated as "little" at the target station and if we have more than 10 individuals the presence of the species is estimated «a lot». This will not accurately

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help to measure population trend but it helps to refine the area of occupancy (AOO) of the species.

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8 Annex 2: References

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9 Annex 3: Genus *Peripodisma* in Albania

The three species of the genus occur in Albania but their distribution does not overlap.
The three species have characteristics very similar:

- Chunky shape: No wing
- Medium size: ♂ 18-21 mm, ♀ 21-30 mm
- Abdomen with yellow (♂) and greenish (♀) colour

Male

Female

Among the three species, the differences are mainly on genitalia but also the color of the under side of the post-tibia of insect alive: Greenish for *P. ceraunii*, Yellowish for *P. llofizii*, Bluish for *P. tymphii*.

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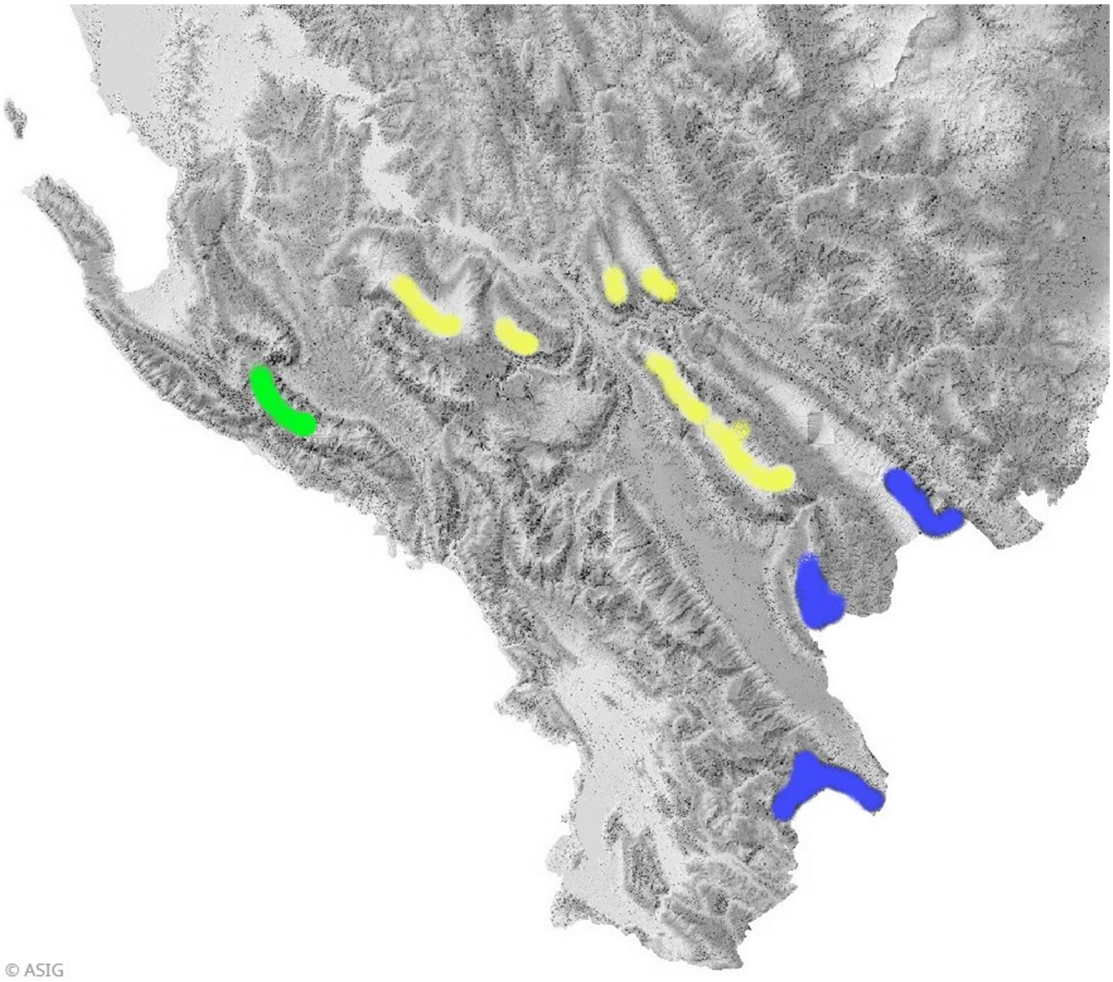
Distribution map of the 3 species (Green for *P. ceraunii*, Yellow for *P. llofizii*, Blue for *P. tymphii*):



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